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EDITORIAL NOTES.

Central Organization and the Industry's Work.

BRINGING into focus the work upon which the Council of the Institution of Gas Engineers have been engaged during the past year, the annual report which has been distributed among the members presents information as to an amount of activity that augurs well for the future. It shows us that these are not the days when the industry can afford to sit still, and passively let things take their course. Such a policy would mean that the course would be shaped by those whose interests are opposed to the largest measure of progress on the part of the gas industry, and this would be fatal to the maintenance of the continuity of a high level of prosperity. The Council have appreciated, and the trend of events brings it home with accentuated force year by year, that the powers of a purely professional organization have their limitations in dealing with the many and protean questions that arise in and about an industry whose technical affairs have been, and are still more so than ever, in a transitory state, whose commercial interests are undergoing change and development in new directions, and whose interests are assailed, both commercially and legislatively—directly and indirectly—on many sides. To assume a confidence in a self-contained power to deal with all these matters without aid and co-operation from outside the Institution, would be to show an egotistical front that would be almost grotesque. The Council, it is clear, have completely thrown off the habit of thinking in terms of an industrial omnipotence; and it is a good thing for the whole industry that this is so. Not many years ago, this could not have been said; but the adamant facts of inevitable change have been more than could be resisted by the Council. So the change in contemporary conditions has been met by a change of administrative attitude on their part. Co-operation in every branch of the industry, and with every organization that has any influential power, is the correct thing; and we see this both in the work of the year and in the report now before us, from which extracts were published last week.

Though there is in existence to-day this expansion of power by co-operation, it is not exactly the thing that was advocated by Mr. James W. Helps when President, nor at various antecedent or succeeding times in these columns. The Committee to whom the base-expansion proposal was referred for report have come to a decision that probably, under the altered circumstances, is the correct one, and that is to postpone for a period consideration of the question to ascertain what will be the issues of, or developments from, the seeds sown by the founding of the British Commercial Gas Association, whose annual revenue is at present approximately £13,000, subscribed or promised. What "relative "position the Institution and the British Commercial Gas "Association will eventually assume, the Committee do not "profess to forecast." No one could possibly do so. But the Association embodies an organization and purposes that may constitute a very powerful factor indeed in the commercial fortune of the gas industry, and upon this commercial fortune much else relies. If the Association does not develop in the direction that will make it a powerful factor in the industry's interests, then there will be no midway place for it; it will dwindle to something that, for the credit of the industry, it would be well to obliterate from among its affairs. But we are hopeful of the development and the raising of the position of the Association to such usefulness that, by common consent of administrators of the industry it will be regarded as an essential the existence of which must be safeguarded at all costs.

Let us not ignore the patent facts of to-day. The Institution of Electrical Engineers are considering the question of how best to gird themselves for effecting a greater commercial development, and obtaining new territory. The initial work of consideration is not where action will stop. That is only natural. The chemical manufacturers are doing their utmost to fix statutory frontiers to the development of the gas residuals business; the oil industry, to working up the daily, financial, and engineering press to encourage the use of oil for power purposes. The retail coal dealers have awakened to the fact that not an inappreciable amount of their business has been superseded by gaseous fuel. We therefore look for the Commercial Gas Association to become a power in the industry. If it does not, then the Institution of Gas Engineers must have a fundamental broadening. The industry itself, *quâ* industry, *must* have its central organization to look after not the individual commercial interests of gas undertakings, but the common or general commercial interests of the whole industry. It *must* have its central commercial organization for conference and for action. It really matters little whether the organization is one that is established specially for the purpose, or whether it is (as a matter of fact) the Institution reconstructed, with the commercial affairs of the industry vigorously dealt with by it from the platform of common interests.

With, however, the British Commercial Gas Association serving its probationary period, the decision of the Reconstitution Committee to recommend that it is inadvisable to make any alteration in the constitution of the Institution at present is perhaps the right one. Thus the whole question is left open and untrammelled for future treatment as occasion may require. This, however, throws upon the British Commercial Gas Association the onus of proving itself an effective organization and a necessity; but too much must not be expected from it at first. The product of machinery of this kind must be regarded in two lights—the defence it affords industrial interests by spreading knowledge, and the development that the spread of knowledge is bound to lead to. But if the development is not immediate, defence of interests by the propagation of information through advertisement—the interest arising from publicity inevitably results in information circulation untraceable in its course, but yet certain—is valuable, and credit must be given to the Association for that.

The other matters in the report (excepting perhaps that referring to the street-lighting specification) do not call for particular comment, as most of them have been dealt with as they have arisen during the year. The report does not give any information regarding the result of the inquiries sent out to gas undertakings in connection with the attack of the Alkali Manufacturers' Association on the liberties of the gas industry in the matter of residual products manufacture and business. Perhaps we shall hear more as to the result at the annual meeting, though it is more than probable that the details will be reserved for use in Parliament at an opportune time. Mention is made of the question of the allowance of depreciation in respect of assessment for income-tax, in regard to which an early settlement is hopefully foreshadowed. There is also a reference to the National Insurance "Bill," which it would be proper to now describe as an "Act." The Council state that they are giving consideration to this, as affecting gas-works employees, with particular reference to Part II. (unemployment insurance). They appreciate the complex nature of the subject; and they feel that, in the interests of the industry, they should do whatever is possible on its behalf. We are afraid that what the Council can do now will not avail the industry very much. But they may do some useful work in association with strike clauses in contracts. These are very loosely drawn at the present time; and the recent coal strike has shown some points where they want remodelling. For example, in connection with coal, when a contractor has a contract running, and a strike intervenes, and then has come to an end, and supply is being resumed, for how long is it fair, or is it fair at all, for him to give preference in the matter of supply to customers who are prepared to pay a higher price than that he is receiving, or is entitled to, under his contract? Preference ought to be given to those with

whom contracts are running; but this recent events show is not always what is practised.

The report also, it will have been seen, includes an interesting statement by Professor Bone as to the research work that has been done in the further elucidation of the factors operative in surface combustion with a view to a complete and consistent theory of the subject. A report by the Institution delegates (Dr. H. G. Colman and Mr. W. J. A. Butterfield) to the last meeting of the Photometrical Commission is also included. This meeting was interesting from many points of view; and especially so from the unanimous adoption of the resolution which declared the opinion that the determination of the illuminating power of gas-flames has lost its significance, and that the determination of the calorific value should take its place as the most important criterion of the quality of gas. In connection with the Institution Jubilee Year's celebrations, the proposal to hold a gas exhibition is referred to, and the suggestion that one of the halls at the White City should be engaged for the purpose is interesting. But it would be well to know what are to be the staple attractions to Shepherd's Bush in 1913 before finally settling upon the White City as the locale of the show.

Street Lighting Specification.

An interesting section of the annual report of the Council of the Institution of Gas Engineers is furnished by the information supplied by the representatives of the Institution (Mr. S. Y. Shoubridge and Mr. Robert Watson) on the Joint Committee who have the above matter in hand. The formulating of such a specification is a work of considerable difficulty; and after it has been formulated, it can only be put forward as advisory or as a guide. In this respect it will, of course, be useful. The findings so far of the majority of the Committee (we do not think these findings have been arrived at without dissentients) are that the draft specification should prescribe a minimum illumination on the horizontal plane at a height of 3 ft. 3 in. above ground-level, and measured either by an illumination photometer, or by a photometer giving direct ray values to be corrected to the horizontal basis by calculation. The recommendation as to illumination being the basis of contract follows the Westminster, Holborn, and Calcutta contracts, and the principle laid down in Mr. Jacques Abady's paper read before the Institution in 1910. Illumination, it cannot be gainsaid, is the correct basis of contract for a local authority; and this has to be recognized now that competition for street lighting has become stronger by the desire of electricity suppliers to obtain a larger proportion of it. In this competition, merit in distributing power (as distinct from the initial power of the source of the light), in all atmospheric conditions, can only be adjudged by the testing of the illumination afforded under certain defined rules. The illumination is what the public lighting authorities require, and what they have to pay for; and a contract, with penalties for default, on this basis is the best possible for ensuring the proper maintenance of the sources of illumination.

If minimum illumination is to be fixed as the basis of contract, the next interesting question is the knotty one as to what is the foot-candle power that shall be the minimum. It will have to vary according to the width, importance, and environment of streets; and no specification ought to prescribe a standard quantity of this kind without stating what are—anyway approximately—the atmospherical conditions that should obtain during testing. There is room here for much dispute between the parties to a contract. We shall await with interest the ultimate report when passed by the Councils of the various Institutions concerned, to see how this point has been dealt with. Having in mind the influence of local and atmospherical conditions upon the results of illumination tests, and having in view the fact that testing at right angles to the rays of the light source to an extent assists in avoiding error and in eliminating the influence of local conditions, it would be instructive to have the reasons why the majority of the Joint Committee have expressed their preference for the horizontal plane, as is manifest from this condition having part in the fundamental basis of the present draft specification. We take it that, beyond what appears in the report, the representatives of the Council on the Committee will be debarred from communicating further information on these points, and from stating their own views upon them, until the final report has been drafted and submitted to the various Councils of the Institutions concerned. The height of 3 ft. 3 in. above ground level for the test is a good one; and it about corresponds with the metre of Continental practice. Then as to the measurement of the illumination, it is satisfactory that the alternative methods of an illumination photometer or a photometer giving direct ray values have been decided upon; but in the latter case, correction is to be made by calculation to the horizontal basis. There is always scope for error in calculation; but this alternative of a photometer giving direct ray values to an extent modifies any criticism that might be passed on the condition as to the horizontal plane as opposed to tests at right angles to the light rays of the source.

Discussions at the Institution Meeting.

No one can tell precisely what is going to happen at an annual meeting in regard to discussions upon the papers and other matters, technical or otherwise, presented for consideration. Sometimes one is able, from the amount of the current interest that is being taken in a certain subject, to say generally that it will evoke considerable debate, and that another will not. But upon other subjects prognostications or anticipations have a bad habit of going astray. The expected often does not happen, while the unexpected does. It is a very difficult task indeed to gauge just what amount of time will be absorbed by discussion; and hence to the human inability to forecast the extent of human eloquence, useful contribution, helpful criticism, or pure loquacity there will be in a meeting, must be attributed the at times crowded state of the sittings, and the scant attention that can be paid to the final papers submitted. The meetings of the Institution have had plenty of illustration of this sort of thing; and the illustration has warned that it is better for all concerned that the programme and sittings should not be too congested, so that authors and subjects, taking into consideration the relative importance of the latter, may all have justice accorded them. We know what happened last year; we know what has occurred in preceding years. Occasionally authors have not had an opportunity, after the trouble of preparation, of appearing on the platform; others have had their papers squeezed into the rear parts of the meetings in such a manner that there was nothing more in the proceeding of calling upon them than the compliment of notice.

The President is anxious that nothing of the kind shall occur at the approaching meeting, and that the product in the way of discussion shall be as valuable as it is possible to make it. He therefore asks that members who are proposing to take part in any particular discussions should communicate their names to the Secretary—not that communication will be any guarantee that time will permit of all speaking who express a desire to do so. If, too, there are any papers which members wish to consider particularly, as soon as they are ready, singly or otherwise, the Secretary will attend to special applications for them. The whole idea of the President is to economize time, and make it profitable by preparation and succinct delivery by members who have something of value to communicate other than compliments to the author, which can all be compounded in the vote of thanks towards the end of the meeting. We hope that the President's wish as to intimation of a desire to speak on special subjects will meet with a good response, bearing in mind the purpose to be served.

How to Neutralize the Sight-Impairing Effects of Electric Lamps.

One of the most damaging reports that lighting by metallic filament lamps as ordinarily practised has ever received has been made by Mr. E. Treacher Collins, F.R.C.S., L.R.C.P., the oculist consulted by the authorities of the House of Commons in connection with their proposal, for some abstruse reason, to change the lighting of the chamber from gas to electricity. It will be remembered that there were members who objected to the change on account of the known mischievous effect of electric lamps upon the eyes. It was consequently determined that an oculist should be consulted; but it is obvious from his report that the partiality of the powers-that-be in the House limited him to ascertaining whether "the proposed new arrangements for electric "lighting were in any way likely to be injurious to the eye-"sight of members of Parliament." Why the reference should have been curtailed in this way, and not have been broadened in scope, so as to have considered the relative banefulness of the two illuminants in regard to sight, is

a point to which a good reason can be affixed, though the authorities would probably not admit its truth. What Mr. Collins, in his report now issued, says, in effect, to the House authorities is this: "You may have the electric light, because, harmful though the light, used directly, may be to the visual organs of the members, the conditions under which it will be applied will counteract the evil." That, in plain language, is what Mr. Collins submits. What he actually states is that "ultra-violet rays may produce irritation of the eyes." "May" is superfluous in the face of experience. He then goes on to remark that these rays are to "a great extent" cut off by the passage of the light through glass, and are completely cut off by glass of an amber tint. This will be extremely interesting to the ordinary user of metallic filament lamps when he realizes that Mr. Collins warns him, as plainly as he can do under the circumstances, that to secure absolute immunity from any injurious effect to the eyes, it is necessary to employ a protecting glass tinted in such a manner that the evil characteristics of the lamps will be neutralized.

This is a matter worth pursuing. The eminent oculist points out that in the House the rays from the electric lamps will be filtered by passing through three layers of glass. Mark the first one well: (1) By the covering of the lamp itself. With Nos. 2 and 3 in the rear, we doubt any great efficacy on the part of the ordinary bulb. Then (2) by Holophane globes; and (3) by the ornamental panes of amber glass, by which the ultra-violet rays will be cut off. The important protection is the amber-coloured glass, which is placed last. However, we see that the eye defence this eminent oculist prescribes against the intrinsic brilliancy and ultra-violet rays of the metallic filament lamp is more than the electrical industry bargained for. If all this is necessary in the heights above the floor of the House, how much more must it be necessary in the close quarters of eyes and lights in the home! How much more necessary, too, must be the protection in the case of the lamps supplementing the lighting from the roof of the House of Commons that are needed to light up the faces of the members! Mr. Collins does not suggest how these lamps are to be dealt with, though this is important. If tinted glass is essential in addition to Holophane globes, more lamps and more illumination, and consequently a greater expenditure for current and lamps, will be required. This will not matter in the House, nor does it seem to matter in any place the lighting of which is paid for out of the public purse. Nor does it matter in the millionaire's house. But it is a point that very much matters in ordinary households, where we can see, by the aid afforded by Mr. Collins and other experts, that economy and eye-defence will soon be in terrible conflict.

So far there is nothing in the report that warrants any change being made in the lighting of the House. The report simply shows to this point that the House authorities are proposing to introduce a type of lamp that, *per se*, is harmful to the eyes, and displacing one that is not harmful; but that the conditions of use with Holophane globes and amber-tinted glass intervening between the lights and the optical organs of the members will nullify these effects. This, however, does not supply any reason for the change. There is one other point that is equally favourable to gas. Mr. Collins states that variations in the intensity of illumination at its source, so that there are glittering or glaring points, is often found to be a source of discomfort to the eye. Here we are getting on the subject of intrinsic brilliancy, and here again the metallic filament lamp fails in the comparison with gas lighting. But in the squares of the roof of the debating chamber, Mr. Collins found the illumination to be more uniformly diffused and freer from points of a glittering character when they were lit by the electric light than when they were lit by gas. Why? "This," he remarks, "is accounted for by the dispersion of light which is produced by the Holophane globes around the electric lamps." Why did not Mr. Collins try the metallic filament lamps without Holophane globes? and not draw conclusions from incomparables. Or, better still, he might have tested both gas-lamps and electric-lamps fitted with Holophane globes. That would have been a fair comparison.

The result of the report is that it indirectly gives reasons why a change from gas to electricity should not be effected. Reading between the lines, too, it indicates that the lighting of the House by gas-lamps could be improved by the adoption of modern lamps fitted with Holophane globes. Of course, there is little use, in connection with the House, in talking of the economy of improvement by merely utilizing modern gas-lamps and new globes. Efficiency, however, from all physiological points of view, is on the side of the gas-lamps; and therefore the object of the proposed change is cloaked in greater obscurity than ever. However, we suppose the authorities of the House have made up their minds to the change; and therefore for the gas industry the greatest value in Mr. Collins's report will be found in the assistance that it will render in the propagation of useful knowledge.

The Chemical Trade and Gas Residuals.

Not long since the "Chemical Trade Journal" was agreeing with us, in respect of the interpretation we placed upon the meaning of the Model Clause—framed by Parliament, and ratified by long use—referring to the residuals powers of gas undertakings, and the chemical manufacturers were mildly derided by it for their misinterpretation. That our rendering of the meaning of the clause was true, has been acknowledged by the leading Counsel for the Alkali Manufacturers' Association [*ante*, p. 384, second column]. To that extent, the "Chemical Trade Journal" therefore was on the right side. Whether, however, our contemporary has had a little rap over the knuckles from anyone among the chemical manufacturers in connection with its agreement with the interpretation of the clause from the point of view of the gas industry, we cannot possibly say; but there appeared to be a smart change in its attitude towards the subject, and since then the matter has consistently been regarded from the chemical manufacturers' side. We have not taken notice of this before; but really one cannot help making allusion to an editorial paragraph that appeared in the issue for May 25. There it is remarked: "It has been stated that the chemical manufacturers are seeking to curtail the commercial freedom in the residuals products markets, and that they have been for a long time masters of the situation. We contend, however, that they are only endeavouring to maintain the freedom of the market, which, owing to recent developments among gas companies, is being threatened." This statement will require a very close and prolonged microscopical examination in order to trace its logical part. Our contemporary contends that these benevolent chemical manufacturers are only endeavouring to maintain the freedom of the market, which is being threatened. What are the grounds for this statement? Can taking away the residuals purchasing power of gas undertakings be called an act in the maintenance of the freedom of the market? Is the gradual placing on gas undertakings of the prohibition against "dealing in" or purchasing, and gradually compelling all that do not work-up their own liquid products to sell to the chemical manufacturers, the right lines upon which to maintain the freedom of the market? Does the placing in commercial bondage to the chemical manufacturers of these undertakings assist in maintaining the freedom of the market? What the gas undertakings had the power to do, what some had done under these powers, what others may do with the retention of the powers, all help to broaden, and not to restrict, the markets, and that is in the public interests. Such broadening of the markets is not threatening their freedom, as our contemporary suggests; and truly the suggestion is a peculiar one, with before us the work of the chemical manufacturers in Parliament this session. Freedom in purchase and sale for the chemical manufacturers; but prohibited purchase and restricted markets for sale of residual products by gas undertakings. That is what our contemporary calls "maintaining the freedom of the markets." Its reasoning is very obscure. To know what it really believes that these unselfish altruistic chemical manufacturers are in Parliament for this session would be extremely interesting.

Then our contemporary speaks of the privileged positions of gas undertakings. "It must not be forgotten," it remarks, "that the gas companies are in a privileged position, and that at least 85 per cent. of their revenue comes from a source which is not subject to any direct competition. How many chemical manufacturers are in a similar position?" This statement, with the facts before us, is both interesting and entertaining; and there is some doubt as to whether our contemporary stopped to examine the facts before committing itself to such a distinguished piece of error. In the first place the percentage mentioned is not correct. The gas industry finds the competition for lighting purposes of electricity, air gas, acetylene, and oil rather of a direct nature; the gas industry is in direct competition with coal, electricity, oil, and anthracite for heating; for

cooking, with coal, oil, and electricity; and for power, with steam, electricity, suction and other producer gas. In its raw residuals and products from the residuals, the gas industry has competition from several quarters, including the chemical manufacturers. Our contemporary, we suppose, does not classify all this as direct competition; we do. If it is not competition by town gas with town gas, it is a competition that restricts the area of the business of town gas. Therefore, the final interrogation as to "How many "chemical manufacturers are in a similar position?" is not to the point. We turn over a few pages of our contemporary, and observe the report of Messrs. Brunner, Mond, and Co. We read: "After paying a dividend of 7 per cent. "on the preference shares, a dividend of 27½ per cent. on "the ordinary shares, allowing for depreciation of patents "£2500, and adding to suspense account £100,000, there "remains £63,220 to be carried forward. . . . The "dividend has been 27½ per cent. for four successive years. "For each of two years before that, it was 30 per cent." How many gas undertakings are in this position? Parliament takes very good care that there are not any. Only authorized capital, only authorized dividend, only an authorized maximum or standard price for gas. That is the position of gas undertakings; no restrictions of the kind apply to chemical manufacturers. Nevertheless, the opulent chemical manufacturers, with massive dividends, ask for fuller freedom for themselves by placing greater restriction upon the gas industry. That is just what they are in Parliament for; that is what the "Chemical "Trade Journal" calls "maintaining the freedom of the "market." We are afraid that it is impossible to endorse our contemporary's views upon this matter, nor the sense it applies to its own words.

The "Elland" Vertical Retort System.

The "Elland" intermittent vertical retort system is now before the gas industry as a complete and workable one, and therefore now ready to take its place among modern commercial means of carbonization that have for their aims economical working and enhanced product. The plant is in daily use at the Cleethorpes Gas Company's works; and the town is at the present time entirely dependent for its coal gas upon the plant, which, as a report elsewhere shows, is day by day affirming that the patentees and contractors for the plant were, in their guarantees, cautious in assessing its abilities. The Cleethorpes Gas Company, since Mr. E. J. Brockway has been the Engineer and Manager, with a Board of Directors (of which Mr. David Smith is the Chairman) all of progressive tendency, have proved their right to the claim that they are among the builders of knowledge in the gas industry. We know of no gas-works of similar size that have such variety and completeness of modern plant as those at Cleethorpes; and that this is not antagonistic to a cheap supply from such a moderate sized works is evinced by the fact that the ordinary price of gas is 2s. 2d. per 1000 cubic feet. The intermittent vertical retorts bring the plant quite into line with the newest types of carbonizing equipment. We need not speak here of the productive results of the plant. They will be found elsewhere. But there are points about the installation that show the infinite character of the field that carbonizing plant and its auxiliaries supply for ingenuity and new ideas. Throughout the plant, one sees here and there, in this and that, fresh ideas for facilitating operation and minimizing labour; we see, too, fresh notions for giving assurance against breakdowns; we see, further, the plans for defence against any excessive wear and tear. That the method of charging is good—supplying as it does a porous charge—is proved by the low pressures disclosed by the pressure-gauges; and the ability for placing a measured charge in the retort, according to its condition in the matter of carbon, is notable. The mode of quenching the coke, which relieves the retort-house of steam, and protects the steel and iron-work from its harmful effects, is attractive. These are among the points of interest of the new plant; but fuller information will be gathered from the detailed report in other columns.

Gross and Net Values.

Practically the world over, except in France, calorimetrists have shown a preference for "gross" rather than "net" calorific values. We were obtaining such a consensus of opinion favourable to the "gross" expression (in conformity with the favour shown it by the Metropolitan Gas Referees) that the adherents to net value appeared likely to gradually transfer themselves from the minority to the majority. But at the recent Centenary Celebration in Philadelphia, Dr. E. B. Rosa, Chief Physicist of the Bureau of Standards in the United States Department of Commerce and Labour, came out as a champion of the "net" heating value on the ground that it is a truer measure of the quality of gas than the gross, though last week we saw in the circular issued by Mr. S. W. Stratton, the Director of the Bureau of Standards, that gross and not net calorific value is specified. Therefore, evidently Dr. Rosa has not persuaded those who have the making of rules and regulations that his view is the correct one, and that the net heat is the only true criterion of the value of the gas. Dr. Rosa is a little vague and not very strong in the reasons he advances for his preference; and what he has to say does not coincide with the views put forward in the circular of the Bureau of Standards (*ante*, p. 577). The proposals he makes for improving the calorific testing of gas suggest academic complication. In order to give gas manufacturers the advantage of quoting gross values, because they look better, he suggests that the gross value should remain as the standard, but that the net should be determined, and a fixed equivalent to the result of the net determination should be taken as the gross. He further proposes that the measured net heat should be corrected to the local annual meter temperature and the mean annual barometric pressure, instead of to 60° Fahr. and 30 in. bar. He commends these points to the consideration of the American Gas Institute, and proposes that a Committee of this body should, in conjunction with the Bureau of Standards, study the subject. He believes that the result would be that the Institute and the gas interests at large would favour the adoption of such changes in practice. We are of the contrary opinion. The whole desire of the gas industry now is to render tests as uncomplicated as possible; and the tendency is to render the B.Th.U. supplied by the gas industry so cheap that the difference of a few one way or the other per cubic foot due to variations of local temperature and barometric pressures from the accepted standards cannot matter much to anyone. At any rate, such a difference is not a sufficient excuse for trying to give a more scientific appearance to a calorific standard by dressing it up in the additional "corrections" suggested by Dr. Rosa.

Municipal Gas-Works Results.

There are some further reports recently to hand, setting forth the results of the working for the past financial year of gas undertakings owned by local governing bodies; and they are as satisfactory as those which have preceded them. A slight increase in gross profit is reported from Congleton, though the net profit is somewhat smaller, owing to the expenditure of a sum on new plant and a larger allocation for income-tax, depreciation, &c. The gross profit on the present occasion is £3364, and the net profit £1309. At Haverhill, the income was a little less than for the preceding year—a fact which is explained by a reduction in the price of gas and by a falling off in the quantity of gas used during the coal strike. As a result of the latter trouble, further provision is to be made for the storage of coal. Lancaster contributes £3800 to the relief of the rates, and places a substantial sum to the reserve fund. In addition, for the public lighting nearly 16 million cubic feet of gas was supplied free of charge—which in itself is equal to a contribution of £1514 to the rates. The quantity of gas made shows an increase on the previous year; and the net cost of the gas figures at 8·38d. per 1000 feet sold. There is a surplus at Leeds of £22,223 to be transferred to the city fund in aid of the rates, compared with £18,100 last year; the gross profit on the year's working having been £118,160, as against £111,743. In view of the fact that the revenue from the sale of gas decreased by practically £4000, due to the smaller consumption during the coal strike, this result is rightly regarded as being very satisfactory. The net debt on capital account has been decreased by £144,000 during the last seven years. With a decrease in the quantity of coal carbonized at Leigh, there is an increase of 2·71 per cent. in the bulk of gas sent out—the make of gas per ton of coal carbonized having been substantially greater. The sale per ton, also, is the highest figure reached for several years. There is a net profit of £3434.

More Good Reports.

The gross profit of £4073 at Newbury is the largest recorded there. A sum of £400 is to go to the district fund in relief of the

rates; and a substantial amount will be placed to the credit of the renewal fund account. While the rates have been receiving assistance from the undertaking, the financial position has at the same time been vastly improved by judicious utilization of revenue balances in other directions. A record make of gas per ton of coal is reported from Rotherham, where the total quantity sold also shows an increase of 5 per cent. as compared with the previous year. The item in which a reduction is seen is that of unaccounted-for gas. There is a net profit of £6635; and if the gas for public lighting (£2376) is again given by the department as in former years, there remains an available surplus profit of £4260, which is £150 more than for the year before. The gross profit at Shipley is £17,851, which is the largest yet made by the department, and £2344 in excess of the previous year. Of the net surplus of £3071, more than half has been utilized in payment for new coke-conveying plant; the remainder going to the reserve fund. The net profit per 1000 cubic feet of gas sent out is 4·06d.; whereas three years ago there was a net loss of 1·45d. There is an increase both in the total quantity of gas made and in the make per ton. Altogether the year has, it is stated, been the most successful, both as regards the expansion of business and the financial results, since the Council purchased the works. A larger sale of gas was experienced at Smethwick; the increase being nearly 8 per cent. One feature of the report is that the consumption of gas for power and manufacturing purposes exhibits an increase of close upon 19 per cent. The gross profit on the working is £20,156, which compares with £20,832 a year ago; but in considering these figures, regard must be had to the fact that a reduction in the price of gas was made to prepayment and small consumers during last year, as well as to the unavoidable loss due to the decreased production of coke and other products. The net profit is £10,714, against £10,458.

An Aspect of Strikes.

One of the results of last year's labour disputes is seen in a Parliamentary White Paper issued a few days ago, giving particulars of claims for compensation for damage to property by rioters made during the twelve months ending Nov. 1, 1911. These claims were lodged under the provisions of the Riot (Damages) Act, 1886; and they are in respect of injury done to private property and public buildings. Over the period referred to, the number of claims lodged in England and Wales totalled 1304; the amount of compensation asked for being £55,304. Of these, 983 claims were allowed; and the total amount of compensation paid or settled to be paid was £31,786. The largest number of claims (439) was in regard to property at Liverpool, where there was much disturbance during the strike period. The compensation demanded (£5479) was not, however, so great as in some other cases. The claims allowed numbered 336; and the compensation granted was £3129. The most serious damage was evidently caused in connection with the South Wales coal dispute, when Tonypandy came into prominence. In Monmouth County, there were 105 claims for £15,574; in Cardiff County Borough, 246 claims for £12,898; and in Glamorgan County, 225 claims for £10,997. The claims and amounts allowed were respectively: Monmouth, 102 and £12,322; Cardiff, 198 and £7396; and Glamorgan, 150 (with ten outstanding) and £3767. There were, on the other hand, a large number of places in connection with which no claims at all were received. For Scotland, the figures involved are very small; the number of claims lodged being eight only, and the total compensation asked for £138. In Ireland, however, there were 455 claims, though more than one-half (296) came from Belfast City, where there was more rioting. Of the total of £6092 for the Irish claims, £3738 was in respect of Belfast, whose claims allowed number 268, with compensation paid amounting to £2248.

Labour in Congress.

Sunderland and Merthyr Tydfil have during the past week been the meeting-grounds for two labour conferences of somewhat different characters. The first was the biennial congress of the Gas-Workers' and General Labourers' Union (to be henceforward known as the National Union of Gas-Workers and General Workers), and the other was the twentieth annual conference of the Independent Labour Perty. In the course of his Presidential Address to the gas-workers, Mr. J. R. Clynes, M.P., claimed that in increased wages alone the members of the Union had obtained ten times more than the whole of the members put together had paid since the organization was started. The Union had also been responsible for securing compensation for injured members amounting to £100,000. With this glowing picture before them it is hardly surprising to learn that later on in the meeting it was decided to increase the salaries of the general officials by 5s. a week. Another matter discussed was the relations between the Union and the Federation of Trade Unions. It was, as a result, determined to leave the Federation, and not to be represented at the forthcoming annual general conference of that body. The subjects brought before the Independent Labour Party ranged from Russian politics to adult suffrage; and the Chairman (Mr. W. C. Anderson) gave his views on the cause of the labour unrest. Labour co-partnership, Mr. Anderson maintained, was really an admission that the wage-system in its present form was unjust and indefensible. Happily, he added, the advocacy of profit-sharing and co-partnership was being revived twenty years too late to offer any serious menace either to Trade Unionism or public ownership—with which expression of opinion Mr. Anderson may be left. A matter of more immediate concern to members (if it could be made to materialize) would be a motion by Mr. Keir Hardie declaring in favour of a minimum living wage by legal enactment for all workers, and the establishment by law of an eight-hour working day for all industries and trades. There was certainly nothing novel in the suggestion. Possibly, however, there is some belief in the minds of the labour party that each time the resolution is passed in conference brings nearer the translation of the proposal into an accomplished fact. But this may prove a mistaken notion.

Depreciation and Income-Tax.

We are asked to intimate that advantage will be taken of "Institution Week" in London to call a meeting of representatives of gas companies in the United Kingdom to receive a report of the negotiations which have taken place between a deputation consisting of delegates from the Institution of Gas Engineers and a Committee representing several large gas companies, and the Inland Revenue authorities, in connection with the question of depreciation allowance and income-tax. A circular giving particulars of the place of meeting, &c., will later on be sent out.

Personal.

Mr. James Parker, Outdoor Superintendent of the Bolton Corporation Gas Department, has been presented by the employees in his department with a smoker's cabinet, a gold-mounted umbrella, and a gold-mounted walking-stick, as a mark of their respect and esteem, and in celebration of the recipient having completed fifty years' service with the department.

The Directors and staff of the Chichester Gas Company have presented a handsome silver tea service to Mr. and Mrs. V. V. Vick, in celebration of their silver wedding, and of Mr. Vick's long services of thirty-one years as Secretary to the Company. All the officers and workmen assembled to witness the presentation, which was made by the Chairman of the Board, Mr. W. A. Walker, of Worthing, who referred to Mr. Vick's long and honourable services for the Company, and the close attention which he had given to his work. Mr. Joseph Cash (one of the Directors) supplemented this by testifying to the admirable way in which Mr. Vick performed his duties whenever he had had to meet him professionally, before becoming a Director. Mr. T. E. Pye also spoke in high praise of Mr. Vick's work, and related instances of personal kindness received at his hands.

Masonic.

On Saturday, W.Bro. Arthur Valon, P.M. of the Evening Star Lodge, was installed in the chair of the Junior Engineers' Lodge, No. 2913; and W.Bro. Walter T. Dunn, who had been re-elected Treasurer, was subsequently invested in that office.

The Installation Meeting of the Northern Star Lodge, No. 3053, was held at the Midland Hotel, Manchester, on Friday, the 24th ult., when the W.M., W.Bro. Harold Barker, installed his successor, Bro. Fred. J. West, the Senior Warden of the Lodge. Subsequently, the officers were appointed and invested, as follows: S.W., Bro. S. Meunier, Stockport; J.W., Bro. T. W. Jordan, Stockport; Chaplain, Bro. F. E. Moss, Wigan; Treasurer, W.Bro. W. Whatmough, Heywood; Secretary, W.Bro. Robert G. Shadbolt, Grantham; S.D., Bro. James M'Ewan, Manchester; J.D., Bro. E. J. Wellens, Hebden Bridge; D.C., W.Bro. J. W. Broadhead; Organist, W.Bro. J. E. Williams; Assistant-Secretary, Bro. E. O. Watson, Rawmarsh; I.G., Bro. J. Bond, Southport; Stewards, Bro. L. Hislop, Uddingston, Bro. W. B. Hudson, Manchester, Bro. John Fisher, Lytham, Bro. J. W. Morrison, Sheffield; Charity Representative, W.Bro. J. W. Scott, Stockport.

ELECTRICITY SUPPLY MEMORANDA.

An Industrial Committee—Frequent Visits of the Competent Person—"Independent" Cookery Tests and a Few Plain Questions—Metallic Lamp Litigation—Burden of Bray—Power in the Textile Industry.

THE "larger policy" movement of the Institution of Electrical Engineers is a matter upon which the gas industry must occasionally cast an eye when a little time can be spared from the concentration of work upon its own vertical and horizontal expansion. The contradictory opinions regarding the causes adversely affecting the broadening of domestic electrification, and the like-charactered views as to the ways to negotiate them in the most effective manner, had hardly ceased vibrating the air of the Lecture Hall of the Institution when the annual report of the Council was published; and in it is found an announcement as to a decision of the Council to appoint an Industrial Committee. To this Committee are to be referred for consideration and report all industrial matters coming before the Council; and they are to report to the Council on any industrial matters, which, in the opinion of the Committee, affect the electrical industry, and in respect of which the Institution might usefully take action. The constitution of the Committee is to comprise eighteen men drawn from members, associate members, and associates of the Institution, at least six of whom are to be members of the Council. If desired by the Council, other persons, not exceeding six in number, connected with other organizations, and not necessarily members of the Institution, are to be elected. The existing Parliamentary Committee are to be merged into the Industrial Committee; and the latter are to take over the work of the Parliamentary Committee. Subject to the Council's approval on each occasion, the Committee are to arrange for special meetings of various branches of the electrical industry in the Institution building. The Council are to inform other bodies of the appointment and existence of the Committee, and ask them to submit from time to time any matters which they consider should be taken up by the Institution. There is a definite and workable scheme of concentration here, which will keep electrical industrial matters in the foreground of deliberation and action.

If part of the work of this Industrial Committee is to try to stamp out the causes that operate against the luxuriant growth of the applications of electricity for domestic purposes, they have a big task before them. This was proved by the discussions to which reference has been made. The causes accumulated make a gigantic heap; and correspondents in the electrical press add to them. The expert knows that the electrical domestic appliance is not the simple handy thing that the gas appliance is, and that it is not proof against the rough-and-tumble of ordinary domestic life. We saw from Mr. Holmes's remarks during the discussions at the Institution meetings, that in Marylebone the users of electrical appliances have their ordinary routine interrupted by the visit, at least once a week, of a responsible inspector anxious to see that in the appliances there is no visible fault in existence or impending. We see the advice as to frequent inspection pushed home by Mr. J. D. Hamilton Dickson, of Cambridge, in a letter to the electrical press. He first points out how in general the electricity consumer is repelled. As a rule, the consumer, writes the candid Mr. Dickson, knows little about electricity; and when he buys some small and useful household apparatus—say, a smoothing-iron, or a kettle—as a venture into an unknown department, the only question he is asked is what is his pressure. Having got the suitable article, he immediately finds trouble through blown fuses (at least if he is on transformed voltage). He does not connect a possible concomitant loss of light in one or two rooms with his new purchase, so when next day "the man" has come and put things right, as far as light is concerned, further attempts to use the purchase prove unavailing, he, being annoyed at having to get more visits from the repair man, gives up the whole business in disgust. "I do not wish," adds Mr. Dickson, "to labour this point; let it suffice that it is an occurrence of *extraordinary frequency*. Within this week I have come across three instances—a kettle, a toaster, a vacuum cleaner." Mr. W. E. Burnand, of Sheffield, has also, in a letter to the electrical papers, pointed to the harm that has been, and is being, done by the sale of apparatus not properly designed or constructed for every-day use.

To return, however, to Mr. Dickson. He speaks of annoyance occasioned by the visits of the repair man; but he recommends that no domestic appliance be sent to any consumer without a competent person goes with it to explain its mode of use, and see that all is right—adding that "if anything should go wrong, do not hesitate to let us know, telephone No. 4881." The need of the "competent person" suggests to the consumer some mystery; the advice as to telephoning shows the consumer the existence in the competent person's mind of convictions, which—born of, and deeply-rooted from, intimate knowledge—compels him, for sheer honesty's sake to give premonition and advice. But this is not all. Mr. Dickson advises that, to prevent trouble, periodic calls be made for a few weeks to see that all is actually in good working order. All this is necessary; but is it not enough to alarm the consumer, and to undermine confidence? Still what otherwise is the electricity supply industry to do? They have to select one course or the other; and perhaps it is better to compel consumers to have frequent visitations from competent persons, and to put up with the inconvenience of their oft-repeated attentions, than to have appliances scrapped. On the other hand, how the charge of 1d. per unit is to pay works' costs, capital and administrative charges, including the salary of the competent persons who have to dance attendance on the new appliances from their advent in service evidently throughout their life, we do not know; and it is a matter that we need not bother ourselves about.

We are aware that the so-called "safest" light requires an almost humanly impenetrable forest of rules and regulations to bring about a modicum of assurance in its safety; and, even then, mansions, drapers' and other shops, public buildings, treasures of all kinds, not to speak of lives, are sacrificed. From the report of the Institution of Electrical Engineers, we learn that the last edition of their wiring rules—numbering well over 100—has been adopted by 49 Fire Offices, the Bombay Fire Insurance Association, and the Fire Salvage Association of Liverpool. Its use is also recommended by 232 supply authorities; and more than 8000 copies have been sold. In view of happenings, and the heavy claims arising out of catastrophes, due to electrical installations, one can well understand the anxiety of Fire Offices to get the best expert guidance on the subject. But the Institution do not guarantee the efficacy of their rules in preventing fire, nor do they show their confidence in them by offering to indemnify all Fire Offices against loss through fires in connection with installations carried out to the letter of the rules.

It is a singular thing that, though electrical folks interested in the subject of electric cooking (the apparatus connected with which, as preceding paragraphs show, requires the close attention of competent persons to keep it in order, apart from those incidental troubles such as blown fuses, and total cessation of supply) are so keen about talking of the savings in baking meat in electric-ovens, compared with coal or gas, they will not talk about the operations of boiling, nor will they explain that—to other people—wonderful mystery of electrically generated heat being able (according to them) to bake meat until it is properly cooked in a manner that will ensure a greater weight being taken from the oven than if the meat was baked in an oven heated by some other means. We have tried one electrical cookery advocate after another to try to get this mystery explained; and without success. Now we will try to get the writer of "Installation Topics" in the "Electrical Times" to furnish an explanation. We put the question to him as plainly as is possible: Take two joints of the same weight and the same constitution, put one into a gas-oven and the other into an electric-oven at the same temperature, remove them from their respective ovens when they are equally cooked, and what is there about the electric-oven that should make it save half to two-thirds of the loss of weight of meat sustained in the gas-oven, or what is there about the gas-oven that should make it cause the meat to lose half or two-thirds more in weight than the electric-oven? Now we shall be very pleased to have an answer to this question from our friend. There must be an explanation—and a scientific one—if it is true that the electric-oven has an effect of this kind that is peculiar to itself, and cannot be obtained by any means in the gas-oven. This saving is credited by our friend with being able to wipe out the cost of electric cooking, and to contribute to a sinking fund to cover the initial cost of the apparatus. Now let us suppose there is this saving—supposing he can advance a really sound, scientific, defensible reason for it—will our friend also tell us what discount has to be made for the extra cost, by electrical means, of all operations in cooking and kitchenwork involving boiling, as compared with gas?

"Installation Topics" writer bases his remarks on what he terms some "independent" results of tests, of great value to contractors and others interested in developing the demand for electric-cookers, which were carried out at that eminently popular town Saltburn-by-the-Sea. These "independent" tests were made with an "Eclipse" electric-oven, under the "independent" supervision of Mr. C. W. Thompson, the Chief Electrical Engineer of the Saltburn Electricity Supply Company, by a cook engaged locally. The "independent" character of the tests were further sustained by taking average figures as to loss by "gas or coal" cooking as quoted by that estimable lady Mrs. Beeton, whose name has become very familiar through seeing it, from our youth up, on the backs of household books. We have seen results of modern tests, by modern cooks, who have no concern in the results, carried out in modern gas-ovens, and by modern methods, and with the joints properly cooked, that show less loss than the average quoted from early Beetonian days. We see that, according to the Saltburn figures, a joint of pork, weighing 6 lbs. 2 oz., cooked in an electric-oven, loses 14 oz., or 14·2 per cent. of its weight; but if a 4 lb. 4 oz. joint of pork is cooked by the same method it only loses 7 oz., or 10 per cent. Therefore it is more economical to bake only small joints in an electric-oven. Small joints in all the tests quoted come out on top. A joint of beef 6 lbs. in weight only lost 7 oz., or 8 per cent.; while a 4 lb. 2 oz. joint of mutton (this must have been a remarkably tough and heat-resisting joint), when properly cooked, had only lost 4 oz., or 5 per cent. We ask any cook to say whether it is possible for heat to penetrate a 5 lb. 2 oz. joint of mutton, and cook it thoroughly, with a loss of only 4 oz. But against these losses are placed an inflexible average of 28 per cent. loss for pork cooked in "gas or coal" ovens; 25 per cent. loss for beef; and 22 per cent. loss for mutton. This is all highly interesting, Mr. Installation Topics; but it is not convincing. It all shows a remarkable ignorance of what is possible with the gas-oven, and of other culinary matters. However, the difference in loss in the case of each of the four joints is weighed up by this writer, who

attempts thus to educate scientifically trained electrical men, at the price of the raw meat—pork and beef at 10d. per lb., and mutton at 8d. per lb., as though what is lost contains all the elemental properties, and proportionately, of the raw meat. Come now, Mr. Installation Topics, what is it that is actually lost? Let us have explicit answers to our plain questions; and we will publish them for the edification or amusement of our readers.

The cloud of litigation has for some time been hanging, and still does so, over the electrical industry in association with the crop of metallic filament lamps that have come on to the market. The General Electric Company are the owners of the Osram lamp patents; and the various makers of lamps work under licences granted by them, or we suppose it would be more correct to say by the Osram Lamp Works, Limited. This firm were the plaintiffs in an action for infringment; the defendants being the "Z" Electric Lamp Manufacturing Company. There appear to have been three patents in question. The first the 1904 patent of Just and Hanaman for the production of pressed tungsten filaments; and Mr. Justice Warrington declares this to be valid, and to have been infringed by the "Z" Company. The second patent, one granted to the Deutsche Gasglühlicht Aktien-Gesellschaft (Auergesellschaft) in 1906, was transferred to the Osram Company; and this was declared by his Lordship to be valid, but that it had not been infringed by the "Z" Company. Then there is a third patent granted to the same German Company in 1907, described as the "weighing" or "loading" patent. But this his Lordship has held to be void for want of subject-matter. It is understood there will be cross appeals. The main patent is that of Just and Hanaman; and if this is upheld on appeal, the General Electric Company will have the upper hand for some years yet in connection with the metallic filament lamp industry in this country. Anyway though a final decision in favour of the Company must be of considerable financial and commercial advantage to them, the electrical industry and competition cannot allow the fact to influence in an upward direction the price of lamps. Consumers find them as it is a considerable item in the sum-total of their lighting accounts. Consequently those makers who are not working under licences are looking with feverish anxiety to the upshot of the appeals, as their profits will, in the event of confirmation of the present decision, naturally be affected.

The Local Authority of Bray are in a grave difficulty. They want to borrow £3500 for providing new plant at their electricity works; and, in making inquiry into the application for this, the Local Government Board have found a condition of local misgovernment of the concern that has made them withhold their sanction. The loan on plant that it is sought to displace has not been completely liquidated; and yet the Council conduct the concern so that the ratepayers generally have to contribute to its support. No one appears to be able to understand the accounts as they are kept; everything, in fact, is in such a terrible muddle that the Board have asked for something clear in the nature of a financial statement to be submitted to them. Here are just a few instances of loose management. In the returns to the Board of Trade made in 1911, 18,000 units were entered as having been used by the Railway Company for pumping, whereas no electrical power had been employed for the purpose. Then in the net revenue account, the debit balance appears as £1147; and a sum of £600 is put down as having been contributed from the rates. This sum is in addition to £1189 charged under the heading of public lighting. So that the total contribution from the rates during the year was £1789—the only return to the ratepayers being the lighting of the roads and sea wall. Then £119 has been expended on house wiring, for which there does not seem to have been any legal authority whatever. Other instances of latitudinal management were found by the Board's Inspector, who also reports that, though the capital expenditure on the undertaking is £16,232, important items of the plant are worn out and absolutely useless, while the roofs and floors of the buildings are in a dilapidated condition. This is a bad example of local mismanagement; but there are many other instances very little higher up in the same street. Is it not time that Parliament, through the Local Government Board, compelled all municipal electric lighting undertakings to be conducted so that they are not a burden on the ratepayers, and so that the ratepayers are not plundered through having to pay more for public lighting than the same and better service could be rendered by the competing system?

The electrical people for some years past have set themselves to obtain possession of the power business in the textile industry. That was one of the main objects of the Manchester Electrical Exhibition of some years since. Though, however, they have secured partial success—small in comparison with the extent of the power field—the electricity suppliers in the textile areas are disappointed that they have not had a complete walk-over. They have ascribed the lethargy of the textile millowners to all sorts of things—mainly to their attachment to (so they choose to term them) "obsolete" methods. But to so accuse the owners of textile factories is not the best way of gaining their ear, and ultimately patronage, as the accusation carries with it the suggestion that the textile industry is administered by men who are old-fashioned and of mediocre ability. We must give them credit for knowing their own businesses, and the methods that suit them best. The owners of the mills and factories have had a large experience now of the various methods of driving their machinery; and experience circulates. We know that there are many owners who are not, upon this experience, prepared to take the electrical drive at the valuation placed upon it by its interested advocates; and there are not a few who are under the impression that the electric drive has been responsible for certain catastrophes that have come under their notice more or less intimately. However, the electrical people had mapped out this field exclusively for themselves; and they determined that no stone should be left unturned to get a stronger hold of it. A Joint Committee was appointed by the Textile Institute and Institution of Electrical Engineers to inquire into the matter of the driving of textile mills; and the Joint Committee has had precisely the ending that might have been anticipated, in view of its distinguished unrepresentative character. How anyone could have imagined that a report emanating from such a constitution, without gas-engine and oil-engine men participating in the investigation, would meet with approval as being an unprejudiced representation of the facts applying to all the systems of driving, passes comprehension. The Committee have had to undergo dissolution; and this is rather humiliating to the electrical people. Leading firms of spinners, manufacturers, and others plainly showed that the constitution was objected to; and there was soon ample indication that any report that was made would not carry the weight that a report emanating from the Textile Institute only should do. A Committee of the Textile Institute is therefore going to conduct the inquiry without the aid of the electricals. The gas industry in the textile areas should note this, and see that the inner knowledge of the electricals as to what is being done is not used to the detriment of gas-engine driving. At the autumn congress of the Institute, at Hawick, papers are to be read dealing with steam, gas, and oil engines, and electric motors.

THE AMERICAN GAS CENTENARY LECTURES.

Publication in a Collected Form.

In recent issues of the "JOURNAL," and again to-day, we have given the principal portions of the lectures delivered at the Franklin Institute, Philadelphia (Pa.), under the auspices of the Institute, the American Philosophical and Chemical Societies, and the American Gas Institute, in connection with the celebration held in the city in April of the "Centenary of the First Commercial Gas Company." It was not convenient to give the lectures in full; but in their entirety they form a very interesting and valuable review of the development of the use of gas, both as an illuminant and as a source of heat and power. The following is a list of the lectures:—

"The Technique of Gas Manufacture," by Alfred E. Forstall, M.E., of New York, Secretary to the Trustees of the Gas Educational Fund of the American Gas Institute, and Past-Secretary of the American Gaslight Association.

"The Commercial and Financial Aspects of the Gas Industry," by the Hon. George B. Cortelyou, of New York, President of the Consolidated Gas Company.

"Gas as an Illuminant," by Van Rensselaer Lansingh, B.S., of New York, President of the Illuminating Engineering Society.

"The Use of Gas for Heat and Power: The Testing of Gas," by Edward B. Rosa, Ph.D., Washington (D.C.), Chief Physicist in the National Bureau of Standards.

"Bye-Products in Gas Manufacture," by Charles E. Munroe, Ph.D., Washington (D.C.), Professor of Chemistry and Dean of the School of Graduate Studies in the George Washington University.

Owing to the voluminous and important character of the series, it has been decided to publish them in book form. The volume will contain 180 pages of matter, and include a complete list of the interesting loan exhibition held in connection with the celebration, and 46 illustrations (with a portrait of each lecturer). The price, bound in cloth, will be $2 (8s. 4d.) post free. As the event in which our American cousins displayed so much interest was one that initiated a movement which has had a far-reaching effect on the moral and commercial progress of England and her dependencies, it is thought that many on this side the Atlantic who are connected with the gas industry would like to have copies of the book. If so, we shall be glad to receive at once, at the "JOURNAL" office, an expression of such a desire, in order that Mr. George G. Ramsdell, the Secretary of the American Gas Institute, who has the matter in hand, may arrange for the necessary number of copies to be struck off.

Municipal Water-Works Association.

We learn that the chief public water-works undertakings of the United Kingdom have recently formed a body called the Municipal Water-Works Association, in order that they may have the advantage of concentrated thought and influence in dealing with the important questions of general interest which constantly arise in the transaction of their business. It is regarded as probable that there will be added to them in the early future such questions as the appointment of Rivers Boards, with power to inspect public water supplies, and of a Central Authority to control the appropriation of watersheds and gathering-grounds. Membership of the Association will consist of municipal corporations or water-works in the United Kingdom supplying water to populations of more than 50,000 inhabitants, and of their chief officers. Corporations or water boards may be represented by two of their members appointed by them for the purpose.

GERMAN GAS AND WATER ASSOCIATION.

Programme of the Annual General Meeting.

THE provisional programme of the fifty-third annual meeting of this Association has just been issued. The meeting will be held, as already announced in the "JOURNAL," at Munich from the 24th to the 28th inst. On the evening of Monday, the 24th, the customary inaugural reception and assembly will take place in the banqueting hall of the Munich Gymnastic Club.

The technical proceedings, on the mornings of the three following days, will be conducted in the Concert Hall, under the Presidency of Herr F. Kordt, the Manager of the Gas, Water, and Electricity Works of Düsseldorf. On the 25th, Herr Kordt will deliver his Inaugural Address; and the following papers will be read: "The Management of Corporation Public Service Works," by Herr M. Hase, of Lübeck. "The Dachauer Strasse Gas-Works at Munich," by Herr Ries, Manager of the Munich gas undertaking. "The Effect of the Quality of Gas on its Use," by Dr. K. Bunte, of Carlsruhe. "Notes on the Munich Water Supply," by Herr Henle, of Munich. In the afternoon, alternative visits will be arranged to the Dachauer Strasse Gas-Works, and to the artesian wells from which the Munich water supply is taken. On the morning of Wednesday, the 26th inst., the following papers will be presented: "The Water Supply of Bavarian Towns and Villages," by Herr F. Hocheder, of Munich. "The Technical and Economical Applicability of New Methods of Sterilization to Large Volumes of Water," by Herr Peter, of Zürich. "Disinfecting Drinking Water with Chloride of Lime," by Dr. Bruns, Professor at Gelsenkirchen. "The Effect of the Dry Summer of 1911 on Town Water Supplies," by Herr Reese, of Dortmund. "Earth Currents and Mains," by Herr Besig, of Frankfort-on-Maine. Alternative visits to works and places of interest in Munich have been arranged for the Wednesday afternoon; and in the evening members will sup together informally at the principal restaurant of the Industrial Exhibition.

On the Thursday morning, private business, including the election of Officers and Members of Council for the ensuing year, and the reports of the various Technical Committees of the Assotion, will be taken. The following papers will also be read: "Novel Points about Gas," by Herr Lempelius, Manager of the Gas Publicity Organization of Berlin; "The Gas-Turbine," by Herr Holzwarth, of Mannheim; and "Recent Advances in the Mechanical Loading of Coal and Coke," by Herr J. Kroschel, of Cologne. A banquet will be held in the Hall of the Gymnastic Club in the evening. On Friday, the 28th, there will be an excursion by special train to Augsburg, where a number of engineering and other industrial works will be open to inspection; and in the evening the members will be entertained by the Corporation of Augsburg.

STATE CONTROL OF GAS SUPPLY IN THE UNITED STATES.

THE portion of the "circular" recently issued by the Bureau of Standards at Washington which deals with the Municipal control of gas supply in the United States has been discussed in recent articles in the "JOURNAL" (*ante* pp. 501, 576). The second part of the "circular" relates to State Control of Gas Supply.

It is reported that thirty-two States have no laws on the regulation of gas supply, while in nine other States the laws provided have so far remained a dead-letter. Seven States only actively enforce requirements as to the quality of gas and the stamping of gas-meters. They are California, Maryland, Massachusetts, Nevada, New Jersey, New York, and Wisconsin. In four of these States—California, Maryland, Massachusetts, and New York—standards of illuminating power are prescribed. In three States—Wisconsin, New Jersey, and Nevada—standards of calorific power are established. Four States limit the sulphur in the gas distributed to 30 grains, and one to 20 grains, per 100 cubic feet. Four States require the gas to be free from, or to contain only a trace of, sulphuretted hydrogen; and in two States ammonia is restricted to 10 grains per 100 cubic feet. Meter testing is provided for in each of the seven States. The States in which the boards or commissions of inspection have been at work for the longest periods of time, and whose operations cover the widest field, are Massachusetts, New York, and Wisconsin. The requirements are uniform for all companies; "but the price of gas, which is subject to the orders of the commission, is so varied that those companies having relatively more difficulty and expense in conforming to these regulations are allowed a proportionate advance in their selling price." This admission that State regulations frequently result in the consumer having to pay more for gas than he otherwise would, should be taken to heart by public authorities and gas consumers.

Further, the gas manager will likely be interested to learn that in certain States the gas-testing commission is empowered to order changes in the method of manufacture, and is actively exercising such right. It is fair to add that the necessity and the wisdom of the granting of such authority to the commission are reported not to be unanimously accepted. The commissions cannot directly impose penalties for non-compliance with technical requirements; but apparently persistent failure to comply may subject a gas company to penalty for non-compliance with the orders of the commission. It is considered that the rules which a State gas-testing commission should make should generally be similar to the municipal testing regulations already referred to. In New York State, all the companies making over 15 million cubic feet of gas per annum are required to provide a photometer; but it is suggested that in States where a calorific power standard is enforced as well as an illuminating power requirement, only companies with an annual make exceeding 50 million cubic feet need provide a photometer. The gas of smaller companies would be tested with a portable photometer. The Bureau hesitates as to whether only companies making over 20 million, or all those making over 10 million cubic feet, per annum should be required to purchase and use a calorimeter.

In regard to purity, the rule suggested by the Bureau affords a striking illustration of the principles by which such a body is guided in legislating for the control of public gas supplies. One would have supposed that the prime consideration in the promulgation of regulations would have been the degree of purity which was known to be essential for the protection of the health and property of the occupants and the owners of premises in which the gas was being used. But we have presented to us the curious anomaly of a regulation by which the amount of sulphur and ammonia to be allowed in the gas varies by 50 or 100 per cent. according to the mode of manufacture of the gas! The Bureau is not concerned with the amount which may properly be allowed, having due regard to its possible ill-effects on health and property, but only with the limit which it thinks can be enforced in any case. To quote its own words: "There seems to be no doubt, however, that water gas can be economically made with a lower sulphur and ammonia content than can coal gas, and hence the limits for the two may well be different." The regulation suggested by the Bureau names maxima of 30 grains of sulphur and 10 grains of ammonia per 100 cubic feet if coal gas or mixed gas is supplied, and 20 grains of sulphur and 5 grains of ammonia if water gas is supplied. Does the Bureau of Standards pretend that sulphur in water gas is one-and-a-half times as harmful as sulphur in coal gas, and the ammonia twice as harmful? If not, what justification, other than a desire to harass a gas manager with limits to which he cannot work with ease, can the Bureau plead for requiring a higher degree of purity with water gas than with coal gas or mixed gas? If upwards of 10 grains of ammonia is permissible with coal gas, it must logically be permitted with water-gas. But once the craze for imposing regulations and restrictions in respect of the quality of gas supplies has taken possession of the official mind, the real interests of the gas consumer become entirely overlooked. It is not a case of what the consumer needs, but of what the gas company can be driven to provide. The relation of the latter provision, and its cost, to the gas consumer's requirements is ignored.

The remainder of the suggested State gas regulations do not differ appreciably from those in the proposed code of municipal regulations. The "circular" proceeds to quote in full certain city and state gas ordinances as examples of recently enacted laws which at the present time are being "successfully" enforced. The city ordinances selected refer to places of widely varying size—viz., Chicago, as representative of cities of over 1,000,000 inhabitants; Minneapolis and Los Angeles, of towns of about 300,000; Omaha, those of about 100,000; and Lansing, of smaller towns of about 25,000 inhabitants. Six State ordinances are also quoted. There are curious points in many of the regulations. In Chicago, it is enacted that the photometer room shall be so ventilated that the carbon dioxide present in the air shall not exceed 12 volumes per 10,000. The Harcourt 10-candle pentane lamp may be used as the standard of light in making the tests of illuminating power, but it is to be standardized monthly, either with a similar lamp which has within one month been compared with a standard spermaceti candle or directly with such a candle. The framers of this regulation might almost as reasonably have specified that a standard foot rule should be verified monthly by comparison with the length of a man's foot.

An appendix gives data relating to gas supply in the United States, quoted from Brown's "Directory of American Gas Companies, 1911." The average candle power of the gas supplied by 970 companies is 20·2; being 17·0 for companies supplying coal gas, 21·5 for those supplying only water gas, and 18·5 for those supplying mixed gas. The average calorific power returned by 327 companies is 620 B.Th.U. gross per cubic foot.

The "circular" of the Bureau of Standards contains much interesting matter, collected assiduously, and well-arranged and classified. But we cannot help thinking that the suggestions contained in it will tend to increase the amount of gas inspection done in the United States, and that in ninety-nine cases out of a hundred no one except the inspector will benefit thereby; while the inevitable result will be that the consumer of gas will suffer either by paying an enhanced price or by not obtaining immediately the advantages of the latest advances in modes of manufacture and treatment of gas.

The late Mr. John Pattinson, the Public Analyst for Newcastle-on-Tyne, whose death at the age of 84 was recorded in the "JOURNAL" for the 16th of April, left estate of the gross value of £58,071.

USE OF GAS FOR HEAT AND POWER.

This subject formed the first portion of a lecture delivered by Dr. E. B. Rosa, the Chief Physicist in the Bureau of Standards of the United States Department of Commerce and Labour, at the Gas Centenary Celebration lately held in Philadelphia.

The lecturer began by referring to the rapid increase which has taken place in recent years in the use of gas for the production of heat and power, and said it was partly due to a reduction in price and better service rendered by gas companies, and partly to the improvement of gas appliances in the direction of greater convenience and efficiency and the invention of apparatus for the accomplishment of many results in new ways. With more than 1300 gas companies in America, having a combined capital of $1,000,000,000 and annual sales of $200,000,000, gas supply was one of the most important of the industries. With this introduction, the lecturer proceeded with his subject.

The Principal Heating Agents.

Dealing first with coal gas, Dr. Rosa pointed out that the first recorded suggestion of the use of gas for fuel was in the patent taken out in England in 1805 by Mr. F. A. Winsor for a process of "extracting inflammable air" from coal. The product was to be applied to heating as well as to lighting. But, in spite of his great enthusiasm, Winsor was not successful in bringing about the utilization of gas for the purpose named; and little was done in this direction until about 1825, when the first gas-cooker was invented. From that time until about 1880 progress was very slow. The last thirty years, however, have witnessed a wonderful development of every kind of heating appliance. Producer gas has been applied much more generally in Europe than America; but it is fast working its way into the industries there, such as glass-furnaces, brick, pottery and terra-cotta kilns, lime and cement kilns, sugar-house char-kilns, silver chlorination and ore-roasting furnaces, &c. Though its use is accompanied by some dangers and disadvantages, Mr. Rosa said the facts that it is the cheapest gas made per unit of heat, and contains more of the energy originally in the coal than any other, and that it is possible to use very poor fuel in its production, make it a very economical gas when properly applied.

Passing on to natural gas, the lecturer explained that, as a fuel, it is burnt in almost exactly the same way, and with practically the same appliances, as manufactured gas. It may be used in the ordinary gas-range, hot-plate, water-heater, or other gas-burning apparatus; the only change necessary being that, on account of the higher pressure, the gas orifices should be smaller. Owing to its higher heating value, less gas is needed to produce the same results. Furthermore, the application of natural gas to coal-burning installations of all kinds is very simple, and, as a rule, very efficient. The growth of this business in the last thirty years is shown by the following figures, taken from the United States Geological Survey, representing the approximate value of natural gas produced in the United States: In 1882, $215,000; in 1892, $14,870,714; in 1902, $30,867,863; in 1909, $63,206,941.

Development of Gas Cooking.

In the patent taken out by Mr. Winsor in 1805 for the manufacture of coal gas, we find the first recorded suggestion of the use of gas for cooking. But the actual utilization of gas for this purpose was much later. Our earliest knowledge of a gas-stove is to be obtained from a magazine of the year 1825 which described it as a piece of "gas apparatus for cooking by enclosing the circle of gas-flames with its reflecting cone in a cylinder of tin, from the top of which a pipe takes off the burnt air." A drawing of the burner was also given, and the writer adds: "A hot-plate has been heated by the gas, and it has also been employed to heat an oven. . . . It cannot be expected to succeed, however, except in the hands of persons whose scientific knowledge enables them to employ it with safety."

For a number of years there seems to have been little done in the way of actual trial, though the geniuses of the time were thinking about it and taking out patents. It is unlikely that we shall ever know who was the first user of gas for cooking. All we know definitely about the subject is that James Sharp, of Northampton, demonstrated the availability of gas cooking in his own house about 1830 or 1832; and a year or two later John Barlow, of Islington, had an apparatus for roasting, boiling, and steaming in the kitchen of his house. This consisted of a tin oven, round the four sides of which, inside near the bottom, ran a gas-pipe, fitted with small burners about an inch apart. On a stand alongside the oven were two or three rings of piping with burners, and over these were placed the boilers and saucepans.

After this, inventions for cooking by gas became more numerous, though the gas-range at first gained very slowly in popularity. In 1850, James Sharp, then of Southampton, delivered a lecture entitled "Gastronomy," in the course of which he roasted before the audience 34 lbs. of beef, 15 lbs. of mutton, and 12 lbs. of pork, and boiled and steamed 24 lbs. of mutton and codfish, four fowls, eight plum-puddings, vegetables, &c., and baked pies and tarts; the whole being done with the expenditure of 156 cubic feet of gas. The same year the famous *chef* Soyer roasted in a brick oven, by means of 216 small gas-jets, a joint of meat weighing 535 lbs.

In the following year (1851), Alexander Graham, a well-known hotel proprietor of Glasgow, exhibited in the Great Exhibition in London a gas cooking-oven, which was fitted with luminous jets inside. Mr. Graham made and sold a limited number of cookers for hotels and restaurants; but, so far, the use of gas-ovens for domestic purposes was practically unknown.

A stove used in Philadelphia prior to 1860 is still in existence, and forms part of the exhibition in connection with the Centenary. It has a peculiar boiling-burner which consists of a piece of $\frac{1}{8}$-inch pipe bent upwards into a sheet-iron truncated cone, containing a perforated baffle-plate of the same material. The upper end of the cone contained a fine wire screen covered with about $\frac{1}{2}$ inch of fine gravel.

From this time on until about 1880, the history of the use of gas for cooking showed an exceedingly slow development. In the year 1860, the "Cincinnati Gazette" said: "At present about 100 families are cooking with different kinds of gas-stoves." The development has gone on at a faster pace in recent years, and thus has brought us to the present state of efficiency and convenience. The gas cooking-range of to-day is distinguished by the following features: The flow of the hot products of combustion from the oven burners is so directed that the food is evenly cooked top and bottom in any part of the oven. Air space insulation of the oven walls prevents the loss by radiation of an undue quantity of heat. Adjustable air-mixers on all burners permit of the complete elimination of soot. The boiling-burners are so set that the placing of vessels over them does not smother the flames, or cause incomplete combustion. These burners and their fixtures are easily removed by the cook for purposes of cleaning, and are put in place again with equal ease; and the aim of all details is to combine efficiency and convenience.

Tests of the relative heat efficiency of gas ranges have been made; but such tests have not been sufficiently standardized to allow of numerical statements being easily made. Additional tests are desirable; and if greater attention is given to the question of efficiency and economy, it is probable that considerable further improvement will be made by manufacturers.

Gas-Heating of Apartments.

About the year 1833, a patent was granted to one Richard Barnes for heating buildings by the combustion of gas or oil; the flame being applied either externally to tubes or chambers through which currents of air were passing, or else placed inside the tubes or chambers. Peckstone, in his "Practical Treatise on the Manufacture of Gas," published in 1841, says: "Coal gas has of late years been applied to the heating of churches, chapels, shops, counting-houses, &c., . . . and has been found to answer the purpose intended." The stove described resembled the cooking-stove of 1825, except that it was provided at the top with a register, instead of the flue.

A form of stove now very popular in England under the name of the "gas-fire," and consisting of lumps of incombustible material heated to a greater or less degree of incandescence by gas-burners so as to resemble a coal fire, was patented by Edwards, in 1849. Seven years later, Nathan Defries was granted a patent for a similar device; the "argillaceous material" specified having fastened upon it fibres of asbestos, which became incandescent on lighting the gas. This was followed three years later by a patent by Reece for a stove in which the asbestos back was the main feature. In spite of the limited use of gas for fuel, a company called "The Gas-Fire Company" was incorporated in England in 1852. This seems the forerunner of the many ill-fated attempts to do a purely fuel business by artificial gas. Room heating is now one of the common uses of illuminating gas.

Water-Heating by Gas.

About 1825, Robert Hicks took out a patent in England for "heating water in baths by means of burning spirits of turpentine, or carbonetted hydrogen gas in chambers, in the bath, or in tubes passing through or under them." Up till about 1890, there were really no convenient and economical water-heaters. Since then, however, the instantaneous water-heater has been developed, and this has greatly augmented the use of gas-ranges—the one being a very important adjunct to the other. Water-heating is one of the most important of the domestic uses of gas; and it is very desirable that water-heaters should be tested systematically, and the results of tests made public for the information of users.

Use of Gas for Industrial Purposes.

In 1806, Mr. Josiah Pemberton exhibited various forms of gas-lights in front of his factory at Birmingham. He was the first to construct a gas-stove—using it for the soldering required in his button factory. About 1840, a Scotch manufacturer named Macintosh made several tons of "cemented" steel by submitting iron at a dull red heat to the action of lighting gas. The carbon for the steel was derived from the gas. In 1857, a patent was granted for the heating of irons for laundry work by means of gas; and in 1859, a soldering apparatus for continuous soldering by means of gas was described in the Technical Press. This included the use of a blast worked by a foot bellows. In an advertisement of Elsner, of Berlin, in July, 1859, it was pointed out that there was scarcely a brand of domestic work, of industry, or of business for which a gas cooking or heating apparatus could not be recommended. Thus it is evident that the utilization of gas for industrial purposes is not of recent origin, and that it has not been brought about through a falling-off in the use of gas for lighting due to the increased employment of electricity.

At the Paris Exhibition of 1867, there was exhibited singeing apparatus for use in wool-works, dye-works, and bleaching-works. Jewellers were also using gas. Plants for chemical and metal-

lurgical purposes and laboratory ovens were also shown. About thirty years ago, what seems to us a curious method of employing gas was considerably in favour. This was its use under boilers for the generation of steam for engines up to about 2 H.P. At the Royal Agricultural Society's Exhibition held in 1879, several forms of such boilers were exhibited. In that year, the South Shields Gas Company had an exhibition of more than 300 appliances in which gas was to be used for other purposes than lighting. To-day there are about a thousand practical applications of gas in the industries; and a conservative estimate places the proportion of gas sold for fuel at one-half the total sales.

Air under Pressure *v.* Gas under Pressure in Industrial Appliances.

The subject of air and gas under pressure is one that is receiving considerable attention at the present time, though the field has not been so extensively explored as the others that have been described. In England and on the Continent, there are a number of companies now operating to furnish gas at high pressure for private establishments as well as for the public lamps. The result is that in Europe there has been more done with the gas under pressure than in America; while, on the other hand, America has probably made more use of the air-blast with low-pressure gas. The disadvantage of the latter for furnace heating is that the efficiency depends upon the two pressures remaining constant. Experience shows that, under working conditions, it is too much to expect that these will remain constant, but the main defect in air-blast burners up to quite recently has been that they were badly designed—their mixing arrangements being inadequate. Such gas-burners as those recently designed, which do away with secondary air and improve the mixing of the air and gas, are a great advance on previous designs. High-pressure gas should have a great field before it in the industrial world. It can be applied to all heating processes with efficiencies reaching in some cases to at least 90 per cent. Its chief charm is its cleanliness and its simplicity; and in by far the majority of cases it compares well in cost with solid fuel.

Development of the Gas-Engine.

The gas-engine really dates from the year 1791, when John Barber patented an engine driven by gas obtained by heating wood, coal, oil, or other substance in a retort. After the gases had been cooled, they passed through a pump, in which they were mixed with air, to an "exploder," at the orifice of which the gas was lighted, and issued, in a continuous stream of flame, against the vanes of a paddle-wheel. This was not only the first gas-engine, but the first gas-turbine. In 1794, Robert Street designed a pump driven by the explosion of turpentine vapour below the motor piston. In 1801, Philippe Lebon took out a patent for an engine to give alternate explosions on each side of the piston. Samuel Brown, in 1823, designed a motor to operate by atmospheric pressure, in which he used an explosive gas-flame to expel the air from the chamber. In 1823, L. W. Wright patented his double-acting vertical engine combined with a governor to regulate the speed. In 1838, William Barnet suggested the compression system of gas-motor. This experimental period of gas-engine research may be said to have lasted seventy years—1791-1860. The latter year, M. Lenoir, of Paris, produced the first practical gas-engine to work rapidly and silently, with electric ignition by jump-spark.

In the years that have followed, improvement after improvement has been made, until the amount of coal gas necessary to develop 1 H.P. has been reduced from 100 to 14 and even 12 cubic feet per hour. Only the principal steps in the development can, however, be mentioned. In 1861, Million proposed compression and the use of a compression or combustion chamber. In 1862, Beau de Rochas took out a descriptive patent of the compression four-stroke cycle now known as the Otto. Otto and Langen exhibited their free-piston atmospheric engine at Paris in 1867; and in 1876, Dr. Otto brought out his famous engine with the Beau de Rochas cycle. Mr. James Robson in 1878 and 1879, and Mr. Dugald Clerk in 1882, patented two-cycle engines; and in 1884, Atkinson brought out a "differential" type with the strokes of the cycle of different lengths. In 1890, when the Otto patent expired, many firms who had been making gas-engines upon other lines brought out new designs, all working on the Beau de Rochas cycle. This gave a great impetus to the sale of gas-engines. With the close of the century came the utilization of producer gas for power purposes; the manufacture of large-sized units of more than 600 H.P. by the John Cockerill Company in Belgium and by Messrs. Crossley and the Premier Engine Company in England; the design of the Westinghouse throttling governor, and the Sargeant engine with cut-off governing; and the rise of the natural-gas engine in large units and the double-acting gas-engine with compression in America.

The two great classes of gas-engines to-day are the four-cycle or Otto type and the two-cycle or Brayton type. The former, which is also called the internal combustion type, with heating at constant volume, has only one working stroke in four, the four strokes being charging, compressing, firing, exhausting. The latter, with heating at constant pressure, usually has two cylinders, one a compressing pump and the other the working cylinder. A third type of engine which should be mentioned is the cycle with heating at constant temperature, or the Carnot cycle. The nearest actual approach to this cycle using gas is the Diesel engine.

Bringing this portion of his lecture to a close, Dr. Rosa acknowledged his indebtedness to the Chairman of the Committee on Gas Appliances of the American Gas Institute for most of the material contained in it.

NEW GAS OFFICES FOR BIRMINGHAM.

The recently issued report of the Birmingham Corporation Gas Committee dealing with the monetary and working results of the department for the financial year to March last showed that great progress had been made in the way of increasing the output of gas during the period referred to; and this gratifying state of affairs still continues. In fact, business remains phenomenally good. Ever since the coal strike, regular weekly increases of 10 or 12 million cubic feet have been experienced, and the drop in output during the labour troubles has already been wiped out.

The citizens who study figures have before them all the evidence of prosperity that they need; and proof of another kind will be available to those not so addicted if they visit, when the work is completed, the portion of the new Council House extension to be devoted to the Gas Department. It was no longer ago than 1885 that the Department was transferred from the Old Square to what was then confidently believed would be a permanent home in the present building in Edmund Street. And yet, after the lapse of comparatively few years, the need for further room made itself urgently felt. With the increase in business, there has naturally been a corresponding increase in the staff; until the present offices have become completely outgrown. Thus it was that, in the extension of the Council House which has now for some time been in course of erection, provision was made for new gas offices of practically double the size of the present ones. But even before moving into them, these new offices have really become too small to fully meet the needs of the case; and a still further extension will be put in hand forthwith. The old offices, it may be mentioned, will, when vacated, be handed over to the Water Committee.

The main entrance to the new building is on the opposite side of Edmund Street to the present offices; and it is worthy of the department. A flight of steps leads straight on to the general office, down a portion of the centre of which is an open space for the public. All the fittings are in fumed oak; and excellent roof lighting is provided. In this office there will be about 170 clerks. Callers will be able to see some up-to-date artificial illumination here, as three high-pressure pendants will be ranged down the centre of the offices. There will also be two-arm pillar lights fitted near the desks. There are a number of rooms set aside for special purposes—including a private Council House telephone exchange and offices for the cashier, the office superintendent, the coke salesman, the audit clerk, and the accountant. Then a private office corridor on the right when entering the building leads to the Committee room, the Chairman's room, the Secretary and Manager's room, and the offices of the Secretarial staff.

If one turns instead to the left on reaching the entrance hall, a well-arranged show-room is reached. This is an important item in the scheme, though, of course, the Department have other show-rooms in their extensive area—namely, at Wednesbury, King's Norton, and Sutton. There will be fitted up a model kitchen; and another portion is to be devoted to water-heating appliances of all kinds. The show-room is piped all over for live fittings; and there are a number of portable screens, so that any part of the room may be shut off as required for the purposes of lectures, demonstrations, &c. The chief salesman will have a private office; and between the show-room and the general offices there is a room for packing up and for storing light articles.

On the lower ground floor are the extensive stores, occupying roughly speaking 10,000 square feet, and arranged so that the work may be carried on with every possible facility. In this part of the building will be the fittings staff (which brings the total clerical staff up to about 200); while provision is also made for accommodating 120 meter inspectors, &c. There is a spacious assembly hall in which the fitters will meet the foremen; and an office for the Fittings Superintendent. Every fitter will have a locker, just big enough to hold his kit of tools and spare materials. All the tools are supplied by the Department to the fitters, who sign for their kits, and if they lose any tools have to make them good. A space in the centre of the stores is devoted to four strong rooms, which can only be approached (by means of a staircase and lifts) from the general offices above; and in these strong rooms all the current books will be kept.

When they move into their new offices, the Birmingham Gas Department will be most handsomely housed; but while looks have been studied (as becomes a great city), attention has at the same time been carefully paid to the lasting character of the work put in. Cheapness and inexpensiveness are no more necessarily synonymous terms in connection with building than in regard to anything else.

Paris Gas Loan.—It was mentioned in the "Journal" for the 12th of March that authority had been given to the Paris Municipality to raise a loan of £8,200,000 for improving the gas supply of the city. Such was the confidence of the investing public that the loan was subscribed for more than eighty-two times over.

THE "ELLAND" SYSTEM OF INTERMITTENT VERTICAL RETORTS.

CLEETHORPES can henceforth claim to be the first town in Lincolnshire to adopt vertical retorts in the daily work of gas production, the first town in the county to depend entirely upon vertical retort working for the whole of its coal gas supply, and the first town in the world to adopt what is known as the "Elland" system of intermittent vertical retorts. It has been known for a long time that the system was being developed and perfected in its operating details at the works of the Cleethorpes Gas Company—this being precedent to the final placing of a contract with the patentees and contractors for the system, Messrs. Robert Dempster and Sons, Limited. The whole work has been finished; and Cleethorpes is depending upon coal gas supplied entirely from these retorts to-day, though the old practically abandoned horizontal retort-house stands to-day a silent contrast to the new house and its equipment and capacity for economy. The old house, however, is still there doing useful work as a coal-store; the beds are still in position, and can be brought into use during the press of seasonal requirement if necessary, though, with a carburetted water-gas plant and a Dellwik blue water-gas plant in the neighbourhood, both with a readiness and elasticity in production that are found very useful at this seaside resort, the days when the horizontal plant will be required as an auxiliary to the new vertical coal-gas plant will be but few. Already, indeed, the Engineer and Directors of the Company are talking favourably of the prospect of any future carbonizing extensions being on the vertical system.

Such an event of general historic and local importance as the introduction of this fresh addition to modern systems of carbonization could not be allowed to pass without a formal opening; and, as a matter of fact, many of Mr. Brockway's colleagues and neighbours were anxious to inspect the whole installation at work—an installation comprising not only vertical retorts but coal and coke handling plant. Therefore last Thursday there was a formal opening; and several members of the gas profession made it their business to be at Cleethorpes by shortly after noon. In the Board-room of the gas offices at the works, they were cordially received by the Chairman of the Company (Mr. David Smith), and his colleagues, Mr. Markham Cook, Mr. John Locking, Mr. George E. J. Moody, J.P., Mr. W. Grant, and Mr. Stamper Anningson. The Engineer and Secretary (Mr. E. J. Brockway) was also there offering hearty welcome. Representing the contractors (Messrs. Robert Dempster and Sons, Limited) were Mr. J. W. Broadhead (the Managing-Director) and two of his technical assistants (Mr. H. J. Toogood and Mr. R. M. Brooke). A few words expressing the pleasure of the Directors at seeing so many expert visitors were uttered by the Chairman; and then there was an interesting preliminary to the inspection.

A FORMAL OPENING AND A SOUVENIR.

Mr. BROADHEAD said they were assembled there that day, at the invitation of the Directors of the Cleethorpes Gas Company, to celebrate the official opening of the vertical retort installation. Part of this installation had now been at work about two years; but the whole of the retort installation was not completed until about last November, since when the whole of the coal gas at the works had been made by vertical retorts. The official opening had been delayed until now, in order to thoroughly prove the efficiency of the plant. It had been somewhat further delayed on account of the coal strike, and also to enable the contractors to take down a special arrangement of charging appliances they had fitted to one bed of ten retorts, designed so as to enable the retorts to be charged without emission of smoke and flame. As there was no steam nuisance with this installation, this bed combined to his mind the whole of the advantages of the continuous system of retorts without any of its disadvantages. However, it introduced two methods of charging retorts, which, in a works of this size, was somewhat of a nuisance; and for this reason, and also to avoid the extra cost of converting the remaining retorts, Mr. Brockway decided to have this bed altered back to what it was formerly—he preferring that the man should be able to look into each retort after it had been discharged. If Mr. Brockway studied his own wishes, this opening ceremony would have been still further delayed, as he would have liked to have had the old meter-house demolished. But on account of some of the connections, this could not yet be done. A full description of the plant and illustrations had been furnished to all present. He (Mr. Broadhead) would not, therefore, go into any details, but content himself with stating that the installation consisted of four beds of ten retorts each, making a total of forty. They were contained in a steel-frame building, filled in with brick panels, 4½ inches thick. A steam chamber and shaft had been provided in which the hot coke was quenched; the steam going out at the top, instead of filling the retort-house. The elevator dealt with the whole of the coal and breeze for the retorts, and the coke for the furnaces. The coke-hoist was so arranged that in case of breakdown to the elevator it could take its place. The principal features in connection with the working of the installation were:

(1) The method of charging the retorts. Whatever state of carbon the retorts might be in, each retort was automatically filled without the aid of measuring-chambers.

(2) Without screening the coal, the coal was, by automatic means, so put into the retorts that it formed a column of small and a column of large coal; thus building up a porous charge which never gave more than an inch of back-pressure on the bottom mouthpiece no matter what coal was used.

Arrangements had been made so that those present would be able to see the retorts drawn and charged. He could not allow this opportunity to pass without thanking the Directors of the Cleethorpes Company and Mr. Brockway, the Engineer, for the patience they had displayed during the protracted time taken to complete the installation; but he ventured to say that, in the completed installation, they had embodied the very valuable experience of two years. He had now pleasure in asking Mr. David Smith, the Chairman, to accept as a souvenir and memento of this occasion a silver rose-bowl, and to formally declare the installation open. He hoped the souvenir would long remind Mr. Smith of a pleasant day.

[The rose-bowl is of silver, and is mounted on an ebony plinth. It bears the inscription: "Presented to the Chairman of the Cleethorpes Gas Company, David Smith, Esq., on the occasion of the opening of the vertical retort installation, May 30, 1912.]

The CHAIRMAN said he had much pleasure in declaring the new vertical retort installation open. They were now all at liberty to inspect the plant; and he was sure it would be vastly interesting to the gentlemen he saw before him. Mr. Broadhead had said the Directors had had patience with him; and he (the Chairman) was sure Mr. Broadhead had had a great deal of patience with them. So that the patience had been mutual. He had given their Manager every satisfaction in the success of the erection of the new retorts. Mr. Broadhead had reason to be very proud of the Cleethorpes Gas-Works, because everything he had done there had turned out eminently satisfactory. The beautiful spiral-guided gasholder that his firm put up some years ago had, in working, sustained the reputation of the firm. The latest achievements in vertical retorts were more than successful. The Directors were delighted to have their professional visitors with them that day; and as the Company progressed a little further, and had some more vertical retorts (which would probably be in the near future), he hoped they would meet again. He had to thank Mr. Broadhead for his kindness, and for the lovely rose-bowl. It was more than he deserved or expected, but he appreciated the kindness and goodwill which prompted the presentation, and which were almost overwhelming. He (the Chairman) hoped they would live to enjoy the friendship one with the other which had been brought about through the gas industry.

ROUND THE "ELLAND" VERTICAL RETORT PLANT.

The visitors then went through the yard to inspect the new plant. They first saw the coal and coke handling plant, and then spread themselves, at their own sweet will, all over the vertical retort installation from the ground furnace floor, on top of the vertical beds, and higher still above the coal, breeze, and coke hoppers to the top conveying plant. They saw everything of the construction—simple, but in the simplicity strength; they saw the retorts charged; and they witnessed their rapid emptying on the bottom lids being thrown open—no hesitation, and a complete clearance into trucks. They saw the trucks on their ball-bearing wheels pushed into the spraying chamber at one end of the ground-floor part of the house, there enclosed by swing doors, and the coke quenched by spraying; they went outside and saw the steam from the quenching chamber escaping into the air from a dwarf chimney. They saw the importance of this in keeping the house free from steam, having in view the bad effect of steam on structural steel and iron work. They witnessed the working of the shoots on the top of the bench, to see how the porous charge was formed; they saw the simple mode of charging the furnaces with coke from the same situation. They also saw how, by the means adopted to secure the porous charge, the gauges attached to each bench were standing level or almost level—slightly varying one from the other according to the duration of carbonization. They were, however, extraordinarily consistent. The worst instance of pressure that could be found at the bottoms of the retorts was well under an inch; one other bed showed fractions of an inch variation; and the others were level. It was a remarkable testimony to the efficiency of the system of charging and to the "porous charge." They found the tops of the beds cool, and not anywhere unbearably hot. The visitors had perfect freedom; and Mr. Brockway, Mr. Broadhead, and Mr. Toogood were kept busy the whole time answering inquiries.

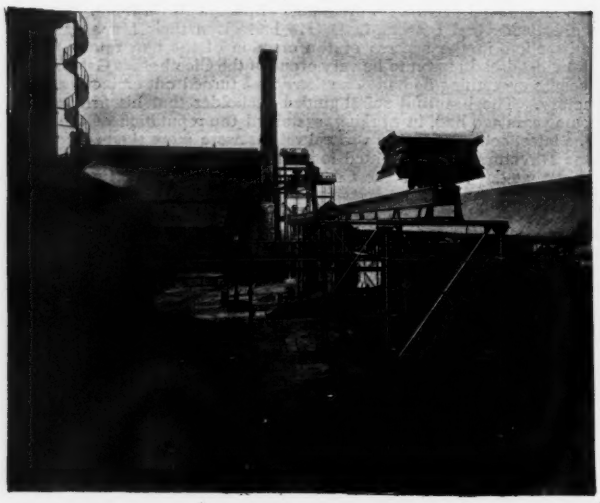
THE NEW RETORT-HOUSE.

A few words of description as to the new house in which the vertical retorts have been erected. The house is of steel framework with filling of good coloured red bricks of pleasing appearance. The measurements of the house are 70 feet long, 40 feet wide, 21 ft. 6 in. to top of bench, and 36 feet to the top of the hoppers. A staircase communicates from the ground to the top of the bench; and a second staircase from the top of the bench to the top of the hoppers. The steel structure of the house and bench-bracing are formed together, in such manner that the roofing becomes simple small span principals and lean-to roofs. The subsoil being sea sand, the Gas Company piled the site, and put in a ferro-concrete foundation. This has proved eminently satisfactory in supporting the concentrated weight of the chimney and the retort-bench. The bench top is paved with brick on edge, and is rendered comparatively cool and comfortable to the feet by non-conducting air cavities arranged in the brick covering of the bench. Ample light and ventilation are provided by a system of glass louvres arranged in the side walls of the retort-house. The chimney is 4 feet square inside, and 100 feet high. The main flue is provided with a damper to maintain a constant draught on the settings. Each setting requires from 3-10ths to 4-10ths draught,

according to the class of coke being used in the fires. As proof of the efficiency of regeneration, the main flue is always quite black; no trace of colour being visible from the sight-plug.

Coal-Handling Plant.

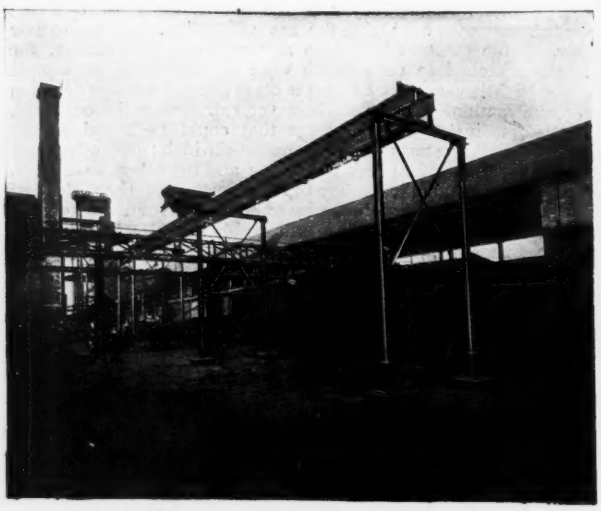
As there is much to be said about the plant, it will be wise to deal with it in its natural sequence. This being so, we will take first the coal plant. The coal is delivered on the gas-works siding, and falls from the railway trucks direct into a receiving hopper. Without further attention, the coal is broken, elevated, conveyed, and deposited either into the coal-stores or into any desired compartment of the storage hoppers, which are situated some 36 feet above ground over the vertical retorts. The coal plant not only deals with the coal, but by means of a special form of Dempster's continuous bucket elevator, the new portion of the plant is made to serve the triple purposes of handling coal and breeze for the retorts, and coke for the furnaces, from the ground to their respective storage hoppers over the bench. Hence economy of handling is assured. The plant is equal to handling 20 tons an hour, and is completely proof against machinery breakdown.



General View of the Coal and Coke Handling Plant.

Coal, Breeze, and Coke Storage Hoppers.

Passing into the retort-house, it is seen that the overhead storage hoppers are of large capacity—capable of containing twenty-four hours' supply at the minimum depth of 6 ft. 6 in. An outlet is arranged over every retort, so that normally there is no handling of the coal during charging; the coal simply flowing by gravity through the charging-shoot to the retorts. A twenty-four

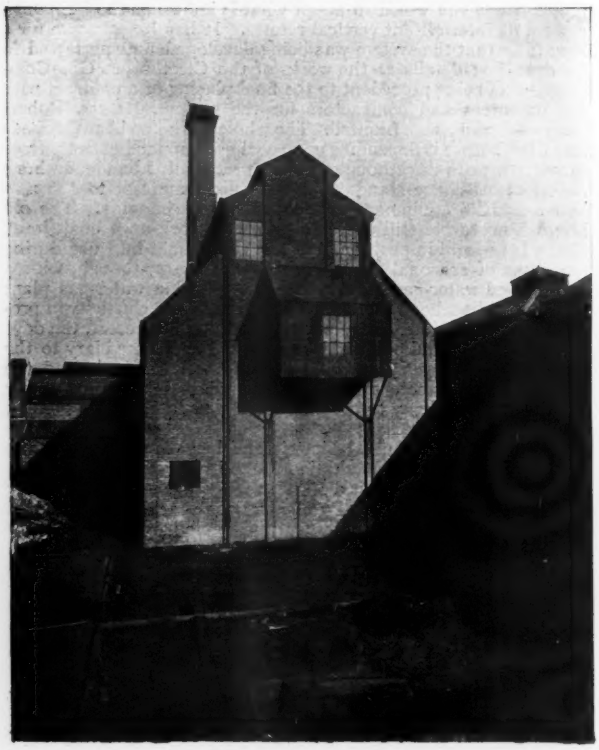


Coke Gantry with Special Hot Coke Rack in Position.

hours' supply of coke breeze for the bottom mouthpiece is stored over each bed in a transverse compartment of the coal-hoppers. An eighteen hours' supply of coke for the fires is stored in hoppers over each furnace which, together with the coke stored in the brick chamber formed over the fire and within the setting, constitutes a twenty-four hours' storage of fuel. The whole of this twenty-four hours' supply of material is ready at a moment's notice to fall by gravity into its destined portion of the carbonizing plant, by the simple pulling of a lever.

The "Elland" Vertical Retort-Settings and Furnaces.

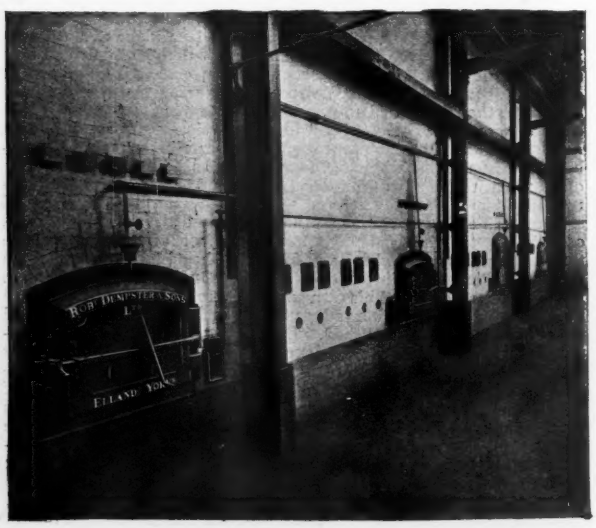
Turning to the central feature of the retort-house—the "Elland" intermittent vertical retorts—the plant consists of forty retorts, arranged in two lines, and grouped in four beds of tens. Each retort is 22 in. by 9 in. at the top, 27 in. by 14 in. at the bottom, and 13 ft. 6 in. long, uniformly tapered, and normally carbonizes 1 ton of coal per day. The retorts are strongly constructed, and



End View of Retort-House.

have square exterior corners. The settings are supported and braced by steel structure, and are carried 8 feet above ground—the furnaces and the regenerators extending downwards to the foundations.

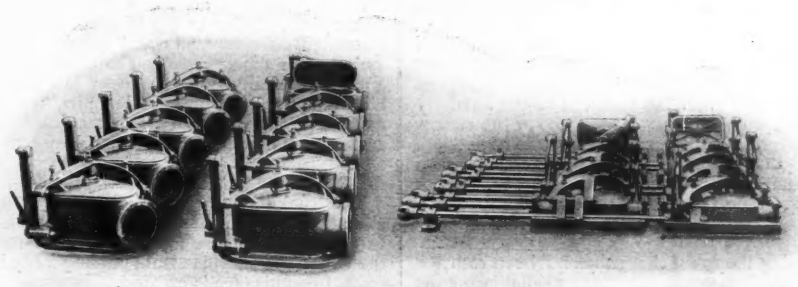
The furnaces are of the stepped-grate type, of liberal dimensions, which conduce to freedom from any clinker troubles, and uniformity of heating. Clinkering is done at Cleethorpes twice a



Clinkering-Doors of Furnaces Showing Primary Air and Secondary Air Slides.

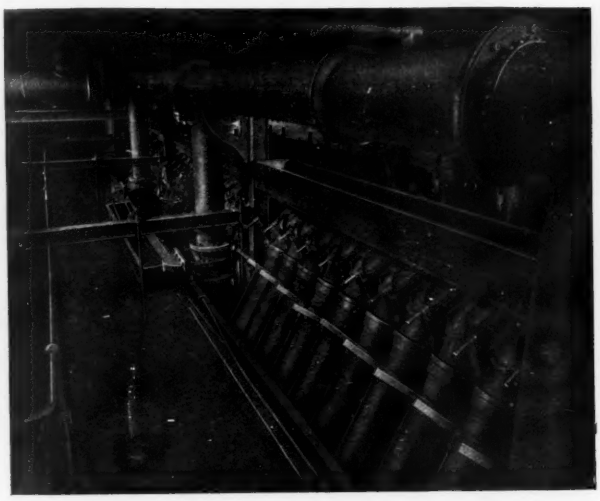
week; but there is practically no clinkering trouble with this furnace. The compartment regenerators are of Dempster's tubular construction, as used so successfully in connection with their Brooke's patent horizontal retort-setting.

The method of heating is from the bottom to the top of the retort; the maximum temperature being applied at the base or large end of the retorts, and the temperature falling off towards the top end—the heats being under full control for each pair of retorts.



"Toogood's" Patent Single-Pull Self-Sealing Mouthpieces.

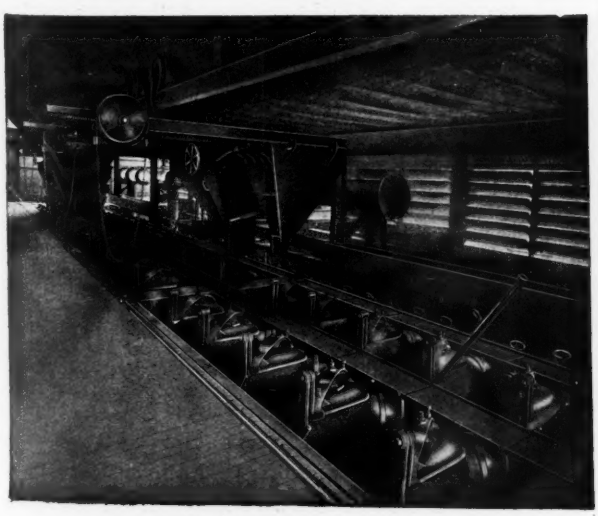
Plenty of opportunity was given for making an examination of the heat of the retorts during the inspection; and it was found in all cases to show a uniformity as between one retort and another that testified to the efficiency of the heating arrangements.



Dip-Pipes, Cleaning-Lids, and Anti-Dip Levers.

Bottom and Top Retort Mouthpieces—Cleaning-Lids on Gas Take-Off Pipes.

Of novel and interesting construction are the retort mountings. The self-sealing lids are specially worthy of notice, seeing that the three movements of the usual eccentric, catch, and raising of lid are, by a neat arrangement of link-work, all combined. For example, in the case of the lower lid, a single pull on a portable lever by the stoker from his position outside of bench, performs all functions of the lid—that is to say, the single pull unseals the lid, opens the lid, and locks it in the full open position, so that the falling coke cannot wear the machined faces, and *vice versâ* on closing. The same design is retained for the top mouthpieces, and for the cleaning-lids; so that the work of opening any lid is a simple single pull, which conduces to the speed and comfort of working, and the simplification of the plant.



View on Top of Bench.

The evolved gases leave by 8-inch diameter take-off pipes, socketed to the top mouthpieces, and thence through 6-inch diameter inclined dip-pipes. Each dip-pipe is provided with an anti-dip valve and lever.

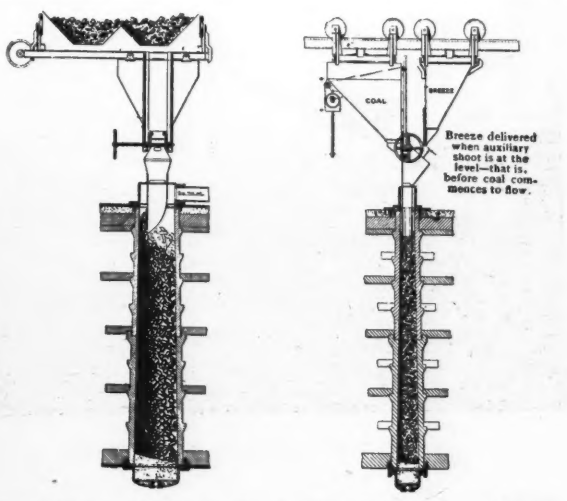
Of special construction are the hydraulic mains. These have curved back plates in conjunction with the inclined dip-pipes; and this construction causes the thick tar to accumulate beyond the curtain-plates, in the open atmospheric portion, from whence it is readily removed by a shovel.

The mains are uniformly kept at a slight pressure by an 8-inch retort-house governor of the Parkinson and Cowan type. Hence furnace gases cannot be drawn in. The anti-dips are closed during the charging and scurfing of each retort, and during the last hour of the carbonizing period.

Automatic Charging-Shoots—Porous and Self-Measuring Charges.

Automatically these shoots perform, during the process of charging a retort, two very important functions, which it will be advisable to describe separately. In the first place, the automatic porous charging-shoot—whereby a porous or very lightly-laid charge is put into the retort, with unscreened coal, thereby preventing objectionable back-pressure, and saving costs of screening the coal—consists simply of a shoot, built to the slide-door of the travelling coal-hopper. The lowering of this balanced shoot into the retort likewise uncovers the outlet, which admits the coal. The delivery end of the shoot is shaped so that the falling unscreened coal is directed tangentially on to the side of the retort, whence the nuts ricochet, and come to rest on the opposite side of the retort, while the slack falls vertically. The result is a porous or lightly-laid charge as indicated; the gas evolved at the bottom of the charge finding ready means to pass upwards to the gas take-off pipes. So successful is this in practice, that the pressure at the lower lid rarely exceeds 10-10ths water-gauge, and this only for a few minutes out of the period of carbonization. Hence the gas more quickly leaves the retort, and is therefore not deteriorated by being held in contact with hot surfaces.

From the accompanying illustration, it will be observed that breeze for the bottom mouthpiece is fed from a separate travelling breeze-hopper into the auxiliary shoot when in a mid-position, that is, when partially lowered into the retort, but before coal has commenced to flow.



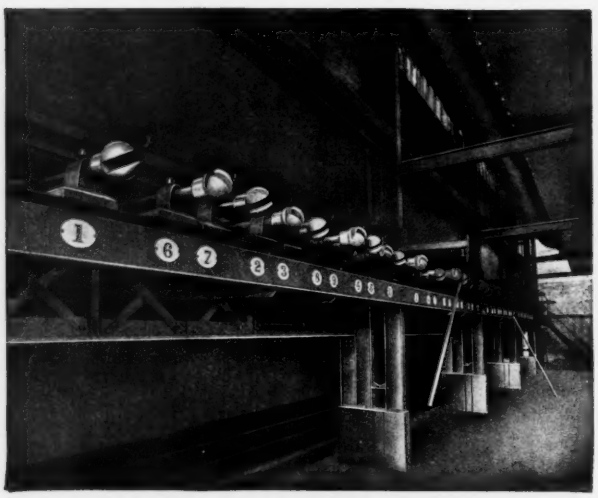
Toogood's Patent Automatic Charging Shoot (to build porous charges from unscreened coal and cause each retort to measure its own charge).

Unlike all previous forms of retorts, the intermittent vertical retort requires an ever-varying weight of charge, fluctuating from 10 cwt. of coal when newly scurfed, to (say) 8¼ cwt. when foul with carbon. This otherwise formidable difficulty is obviated by causing each charge to automatically measure itself. This desirable feature is achieved by the correct relative sizes of the

auxiliary shoot, which enters the retort, and the retort itself. During charging, the coal flows until the retort fills up to the bottom of this auxiliary shoot, and the shoot likewise fills, when the flow of coal ceases automatically. The stoker then raises the shoot from the retort; thereby closing the aperture from the travelling coal-hopper. Meanwhile the contents of the auxiliary shoot fall into the retort; thus bringing the surface of the charge of coal to the desired level. Consequently, it is quite impossible to over-fill or under-fill the retort; and the same predetermined free space over the charge is always and exactly retained, without the slightest exercise of skill on the part of the stoker.

Steaming.

At Cleethorpes, steaming the spent charge has not been resorted to, owing to the very complete water-gas plant available on the works. Each retort, however, is provided with steaming appa-

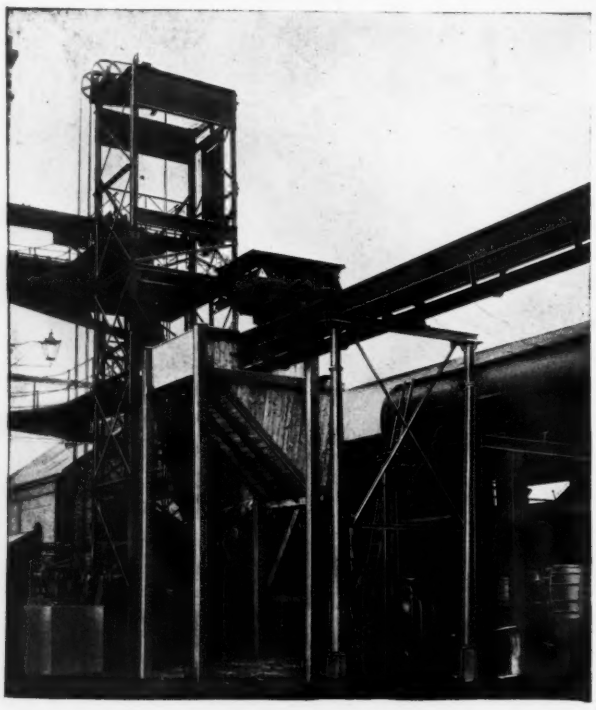


Toogood's Patent Bottom Mouthpiece Mechanism.

ratus, which is only used for scurfing the retorts—scurfing being simplified to the burning-off of the carbon with a slight blast of steam rising through the retort.

Hot-Coke Trucks.

One of the most simple operations conceivable is the discharging of the retorts. The self-sealing lid is released by a single-pull as described, and the 7 cwt. of hot coke falls direct into the hot-coke truck. This truck is worthy of special mention. It is of ample size to receive the coke from either row of retorts, and is exceptionally strong to withstand the falling 7 cwt. of coke. When loaded, the truck weighs nearly 28 cwt. Therefore special facilities were needed to assist in its manipulation by hand. The emptying of the coke-truck is performed in the simplest manner possible; the side discharge doors being fitted with single-pull mechanism, similar to the mouthpieces. Hence the discharge of quenched coke is easily and quickly performed. The truck is mounted on asbestos packed ball-bearing free wheels; and a light 2 feet gauge railway has a slight fall to the quenching chamber, by which means the coke is quickly and cheaply handled by manual power alone. The visitors saw that the coke was large and firm, and contains a very small percentage of breeze.



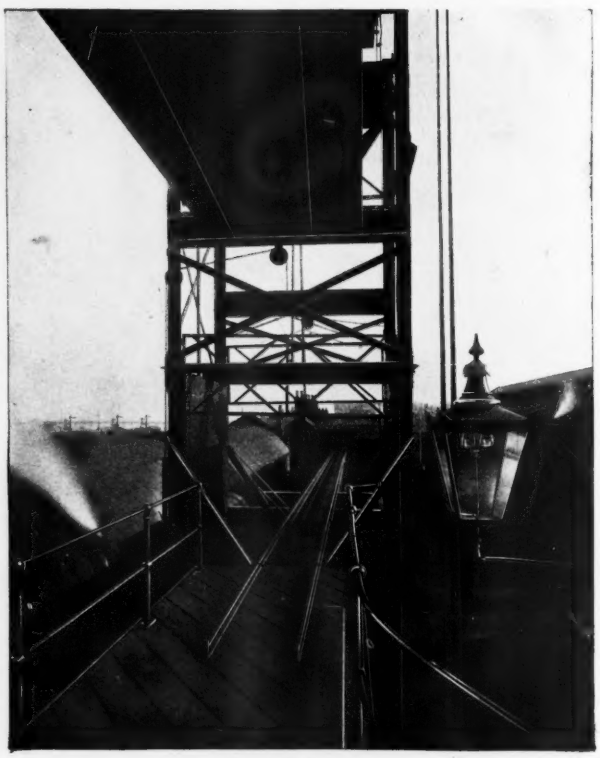
Belt-Driven Coke-Hoist.

The Coke-Quenching Chamber.

The truck having arrived (chiefly by gravity) at the quenching chamber, the door of the compartment is closed, and the spray turned on. The steam generated, of course, assists in quenching the coke; the surplus steam passing away by a separate chimney, so that no nuisance is created.

Expeditious Coke-Handling.

For dealing with the quenched coke in the yard, a high-speed belt-driven hoist is provided, with necessary gantries, screens, &c.; and these are of such an order that 1000 tons of coke can be stacked with the minimum of labour and expense. Coke may also be loaded into railway trucks or into hoppers, as desired.



On the Top of the Coke Gantries.

The hoist, which is connected by curved gantries to the retort-house, may be used to give access to the bench-top, and also, should the coal plant fail, coal, coke, and breeze may be fed to the storage hoppers by its aid.

Gas-Engine Driving, with Steam-Engine Auxiliary.

The whole plant is driven by a 30 B.H.P. gas-engine, which was installed as a duplicate to an existing engine. Both engines drive on to a common line-shaft. Hence one is stand-by to the other; and so risk of annoyance from machinery breakdown is reduced or rendered practically impossible. A small auxiliary steam-engine is installed for working the hoist during the night and on Sundays, when the main gas-engines are at rest.

Labour.

Regarding the important question of labour, the complete installation is worked by two stokers per shift; and since 40 to 50 tons of coal are carbonized per diem, the wages per ton carbonized, including everything from coal-waggon to coke-stack, are 8d. per ton of coal carbonized, which, considering the size of the plant and the scope of the work included, is a remarkably low rate. For comparison with installations in which carbonizing wages are calculated as the wages expended within the retort-house—that is, coal trimming within the house and taking coke to the quencher—two men per shift (the plant cannot be properly worked with a less number, that is one at the top and the other at the bottom, on twelve-hour shifts) can readily perform these duties; the cost working out at 5½d. per ton of coal carbonized.

Working Results.

During 48-hour tests, the plant has yielded from the second-grade Yorkshire and Derbyshire coals generally used at Cleethorpes, 12,800 cubic feet of 15·7-candle gas (No. 2 "Metropolitan" burner), with a consumption of coke of 13·7 lbs. per 100 lbs. of

coal carbonized. But the records of ordinary working are the important thing. Records carefully kept over fourteen days have shown that the plant easily maintains 12,469 cubic feet of 15·71-candle gas (No. 2 "Metropolitan" burner) of 599 B.Th.U. (gross) per ton of coal carbonized, without the addition of steam, and with a fuel consumption of 15·38 lbs. of coke per 100 lbs. of coal carbonized. Each retort yielded over 13,000 cubic feet per diem, which is generally about 15 per cent. in excess of the contractors' guarantees.

The three beds that are working, under the makers' guarantee, are to produce 360,000 cubic feet per day; but a free inspection of the carbonizing book that Mr. Brockway allowed to be made showed that, during the five days preceding last Thursday, the makes were: 368,000 cubic feet, 377,000 cubic feet, 385,000 cubic feet, 382,000 cubic feet, and 381,000 cubic feet.

This is evidence of ordinary working being well ahead of the guarantees. The flexibility of the system is further shown in that work can be varied from a thirteen-hour charge to a nine-hour one (according to the quality of the gas required; the usual working, however, being on an eleven-hour charge.

Smokeless Charging Arrangement.

As Mr. Broadhead mentioned in his opening remarks, an experiment was tried on one bed of the retorts with a smokeless charging arrangement. The actual devices that were used were seen in the yard. The top of this charging arrangement is in the form of a small hopper, with two inlets at top, which were opened and closed by a valve operated by an eccentric lever. After the coke was dropped from the retorts, a small quantity of breeze was run into the retort through one of the openings in the smokeless charging arrangement, and the coal charge was run in through the other opening; and then the valve was again closed. By this means the retorts were charged without a vestige of smoke. But after some six weeks' or two months' working, Mr. Brockway determined to have these adjuncts removed from the retorts, as he preferred that the men should be able to see through the retorts when clear of their charges. But from the point of view of the arrangement being effective for the designed purpose, the experiment was a complete success.

A Luncheon and Some Interesting Speeches.

Immediately after the inspection had been completed, and the visitors had attempted, more or less successfully, to exhaust the interesting features of the new carbonizing plant, and much else that Mr. Brockway has incorporated in the Company's works and methods of operation, the party walked to the Dolphin Hotel, where they were ready for, and thoroughly enjoyed, an excellent lunch. The hosts were the Chairman and Directors of the Gas Company. Mr. David Smith presided; being supported on his right-hand side by Mr. J. W. Broadhead, representing the Contractors for the plant, and on his left-hand side by the Engineer (Mr. Brockway), and near by the other Directors of the Company. All were friends there; and the dinner and the social intercourse combined to make the time exceedingly enjoyable. After luncheon, there were a few toasts, the accompanying speeches being, in the main, directed to the topic of the day.

Room for Every Type of Vertical Retort.

Mr. Charles Wood (Bradford) proposed the "Health of the Chairman and Directors of the Cleethorpes Gas Company." Having addressed himself to the toast, he said he was there that day because he felt it his duty to come and see what was being done at Cleethorpes in connection with vertical retorts. On two previous occasions he had had the privilege and pleasure of seeing the installation, but those were in its earlier stages. He might say candidly he was a great believer in the vertical retort system. In Bradford, they had about half erected an installation of vertical retorts; and he had seen practically all the vertical retort installations working in this country, in Scotland, and those on the Continent. He had believed, and felt all along, there was a tremendous future for vertical retorts; and he said this without any qualification whatever. He further considered there was room for every type of vertical retort. He believed, too, that, by experience in different places with the intermittent, continuous, and combined systems, they would eventually evolve a system of vertical retorts which would supersede the horizontal system, at any rate for moderate and large sized works. He had every faith in the success of the system they were putting in at Bradford; and he had been delighted with what he had seen at Cleethorpes that day. He had been impressed with the tremendous improvements that had been made since the first visit he paid there. The installation they now had was one the Chairman and Directors, the shareholders, and Mr. Brockway would never regret having put up. It was a magnificent installation, and would do very good work indeed.

The toast was heartily endorsed.

Factors in Success.

The Chairman, in replying, on behalf of himself and the Directors of the Cleethorpes Gas Company, said he had to tender their sincere thanks to Mr. Wood for the kind way in which he had proposed the health and success of the Company, and to all the friends present for their ready response. The Directors were delighted to see them there. He did not intend taking up much time in speaking about the work they had had in hand. Mr. Brockway would tell them the scientific and technical details in connection with the vertical retort installation, which had been successfully completed by their good friend Mr. Broadhead, representing Messrs. Robert Dempster and Sons. But perhaps he (the Chairman) might be allowed to allude to what had occurred in connection with their Company during the last fifteen years. He did not do this in any spirit of ostentation or boastfulness, but just to let those present know what they had succeeded in doing. In 1896, fifteen years ago, the output of gas was only 33 million cubic feet. Last year it was 155 million cubic feet; being an increase of nearly five times in the fifteen years. At that time they made a profit of £3166, as compared with £12,145 last year. In 1896, the dividend paid on the old shares was only £4 10s. per cent. per annum, or a total of £2005. Last year they paid a dividend on the whole of the stock capital of £7 7s. 6d. per cent. per annum, or a total of £6628 13s. 2d. The coal rate, with waggon hire, was 4s. 10d. to 5s. per ton; carriage on other materials to and from the works being equally high. In spite of these heavy costs, they sold gas at 2s. 2d. per 1000 cubic feet, as compared with 3s. 3d. fifteen years ago. There were various other causes which had helped them in this matter of prosperity and success. They had, in the first place, in their Manager (Mr. Brockway) the right man in the right place. He was always most diligent and attentive, and took opportunities as they arose. Of course, the natural development of Cleethorpes had been very rapid. New streets and new houses had sprung up all round; but it was the taking of the right opportunities that led to success. If it were true that the secret of success was an unwearied attention to the details of the business that one had in hand, then they knew the reason of Mr. Brockway's success since he first came to Cleethorpes. The next factor in their success was the satisfactory work that had been done by the gentleman to whom they had entrusted the construction of their new plant. Mr. Broadhead had been most helpful to the Company. He had given much time and attention to all their requirements either large or small; and it was certainly to his firm that they owed a great deal for their successful working. Another factor that entered very largely into their success was the technical meetings that the gas profession held, at which were discussed the most economic way of getting the best they could out of the plant they had in their works. So long as this combination existed, so long as they all pulled together, there was no doubt they might hope for further success. By the help of gas engineers those who invested in gas companies would get more return for their money, and the consumers would get still cheaper gas. He hoped that at some future time, it would be possible for him and his colleagues to again extend an invitation to those who were present that day; and he was sure both he and his colleagues would be pleased to see them.

An Eloquent Tribute.

Mr. John Carter (Lincoln) said he had the peculiar pleasure of submitting to those present the toast of the good health of their friend and professional colleague, Mr. Brockway. No more congenial task could have been offered to him (Mr. Carter). To a very large extent, the toast had a personal significance or personal reference, and yet it had to be regarded in relation to the circumstances that accounted for their presence there that day. The Chairman had referred to the growing and continuous success and prosperity of the Cleethorpes Gas Company. He (Mr. Carter) thought they must all have been impressed with this, that the figures with which the Chairman favoured them pointed clearly to the fact that the Company had discharged fully, freely, and fairly, and most successfully, their duty to the residents of Cleethorpes. While he congratulated the Chairman and Directors upon the way in which they were discharging these duties, he was very pleased to note that the Chairman had generously, but justly, in recounting the factors that had led up to the satisfactory condition of the gas business in Cleethorpes, placed first and foremost the services of their friend, Mr. Brockway. He need not stop to tell the Directors of the Company that Mr. Brockway's colleagues had for years held him in very great regard, esteem, and affection. They had given the greatest possible proofs of this that it was possible for them to do in connection with their District Association. It had been their pleasure to place Mr. Brockway in the Presidential Chair of the Eastern Counties Association; and they would not readily forget the efficiency of the services that he rendered to the Association. For some period, too, he represented the Eastern Counties district on the Council of the Institution of Gas Engineers, which he hoped he might without any undue native pride describe as the most influential organization of gas engineers in the wide, wide world. There was not, in short, any member of the gas profession in the district, or in any other district, who had earned and had retained through successive years the regard and esteem of his fellows to a greater extent than Mr. Brockway had done. He did not know which of his qualities to admire most. He certainly did possess the quality of industry that the Chairman had attributed to him. He was a man of bold enterprise; but that enterprise was always tempered by a well-informed judgment. He never lost sight of the fact that the ultimate and inevitable test of their engineering projects was the commercial results they were able to attain. The final test of their finest theories was the business one. During the time that Mr. Brockway had been at Cleethorpes there had been no single innovation that he had introduced (and he had been most enterprising) that had not been justified by the commercial result. A make of 155 million cubic feet, and selling gas at 2s. 2d. per 1000 cubic feet, was a very great testimony to Mr. Brockway's ability and to the acumen of the Chairman and the Directors, who had been able to form their own conclusion that, when Mr. Brockway proposed a certain step, it was safe to follow him.

Development of the Vertical System at Cleethorpes.

Mr. Brockway, who, on rising to respond, was received with much applause, said Mr. Carter's flattering remarks made it almost impossible for him to reply. He would only say that, that if to do one's duty was to do one's best, then he claimed to have done that. Regarding the new plant, in view of the fact that a description had been prepared, it was not necessary for him to say much about it. But he would like to remind his colleagues that vertical retorts were not new to Cleethorpes. In 1904, they erected an installation of vertical retorts on what was known as the Settle-Padfield system. For a period, these were first worked as a continuous process, and afterwards on the intermittent system—together for nearly two years. He had, however, in the latter part of 1906, when giving his Presidential Address to the Eastern Counties Association, to tell his colleagues of disappointment and failure. But he also said that he thoroughly believed in the principle; and that he had every confidence experiments would continue, and,

with the experience gained, vertical retorts would become in the near future keen competitors with horizontals and slopers. This little prophecy had already been fulfilled; and when about three years ago through the rapid growth of the district, he had to consider an extension of the carbonizing plant, naturally he turned to verticals, and the installation they had now to-day was the result. The essence of their contract in respect of the plant was that one setting of ten retorts was to be erected under a guaranteed make of 120,000 cubic feet per twenty-four hours, 12,000 cubic feet per ton of 15-candle gas, and a fuel consumption of 15 lbs. of coke to carbonize 100 lbs. of coal. If the setting proved in all other respects satisfactory, a further three settings were to be erected. The other three settings had been erected. Few words of his were needed to point out the success achieved by the plant; but this success had not been obtained without some difficulties having to be surmounted. There was an old adage which said "Lookers-on see most of the game." If this were true, he might be pardoned if he claimed to have seen things in a truer perspective than actually had the contractors. In his opinion, the first setting erected, save for minor details, had but one pronounced weakness—viz., excessive fuel consumption, and to his mind this had been the one and only real difficulty encountered. This setting he looked upon as experimental. It had restricted flues, which set up a cutting or impinging action of the flame on the fire-clay retorts. Consequently the retorts buckled, the flues collapsed, and the fuel consumption rose accordingly. The second setting was a great improvement, having less tortuous flues, silica retorts, and improved control. This setting did excellent work over a period of two years, during which many experiments were carried out. In his opinion, much time was spent by the contractors needlessly in trying to obtain ideal fuel consumption on a single isolated setting. The four settings now built were to all intents and purposes the same as the second setting, except that perhaps an even less tortuous path of the heating gas had been permitted; and these settings, characterized by simplicity and ease of control, had a fuel consumption to suit even the most exacting engineer. He was no believer in record-breaking tests of a few hours' duration. The only test which was worth anything to a gas engineer was practical sustained working; and he ventured to say that, under this test, the Cleethorpes' installation as a practical gas-making plant, considered in conjunction with its size, environment, and local conditions, was second to none yet erected. He would just like to say a word about temperature. Absurd though it seemed, the idea had grown, that a retort when placed upright, required more heat to carbonize coal, than when inclined or horizontal. They found that, measured on the insides of the retorts, the heats which suited their coal in the horizontal house, equally suited the coal in the vertical retorts. For all practical purposes he found it sufficient to make a mental note of daily results in conjunction with the daily carbonizing records; and any drop in heats was then quickly detected. From information published in the Technical Press, it appeared to be the Continental practice to go round every day with a pyrometer. At Cleethorpes, they had no need to watch the vertical plant like a cat watching a mouse. Everything went forward regularly and smoothly, and they only examined the combustion chambers occasionally, perhaps twice a week. So that it was very evident that either they had a far superior setting, or else the Continental users must work at unnecessary high heats. From the standpoint of economy and labour-saving, he was more than satisfied, while another and not the least advantage over the horizontals was the more pleasant conditions for the workmen, and the entire absence of hard manual labour. He would not say more now. But he should at any time be pleased to give any information to any brother manager; and if any of his colleagues would like to investigate the system further, the works and the whole of the plant were open to them at any time.

Gratification and Recognition.

Mr. Markham Cook, in proposing "The Contractors, Messrs. Robert Dempster and Sons," spoke of the importance of the firm in the gas industry, and of the good work they had done not only in Cleethorpes but in other places at home and abroad. If their work was always done in the same spirit as it had been carried out at Cleethorpes, then they could not help giving their clients satisfaction. It was some four years ago that Mr. Broadhead laid before them the scheme for vertical retort-settings. At that time no doubt the firm saw into the future, and realized that there might be little difficulties. There had been some; but the Contractors had done their best, and had overcome them. He asked Mr. Broadhead to accept, from the Chairman and Directors, a walking-stick as a memento of the occasion of the completion of the vertical installation, and of his association in these times with the Company.

The Raison d'Etre of the Vertical Retort.

Mr. J. W. Broadhead, in responding, said although he had been to many functions of this kind, this was the first occasion on which there had been a presentation made to him. He appreciated the gift very highly indeed. He believed that it had not been given to him so much because he was Managing-Director of Messrs. Robert Dempster and Sons, but purely out of personal friendship. The walking-stick would remind him of many pleasant and pleasing duties in connection with Cleethorpes—not only that day, but on many days past. Some people said that "Success brings its own reward." If this were true, they were doubly rewarded by the manner in which the new plant inspected that day had been received by the representatives of the gas profession assembled there. He would not weary those present with any further details of the plant itself, but he hoped the gentlemen present would make a point of reading the description which had been furnished that day. He would like to say a few words on the past, present, and future of vertical retort carbonization. It was truly said that there was nothing new under the sun. Since the days of Murdoch, many engineers—in this and in other countries—had experimented with vertical retorts; but until recently, no one had evidently made a success of them—the reason being, he took it, that while they could make a larger quantity of gas from vertical retorts and of a higher calorific value than in horizontals, they were not able to economically produce the high candle-power gas that was necessary for consumption with flat-flame burners. However, as time proceeded, conditions had changed. With the introduction of mantles, which had now become practically in universal use, candle-power had become of less moment. Simultaneously, there was the rise in the price of coal; best coal seams in some districts being worked out. The general effect of keener competition, and the more onerous demands of labour, had all tended to ripen the conditions, and render them more favourable to vertical retort carbonization—until now several systems of vertical retorts were in successful operation. If further proof were needed of the influence of conditions, they had the forty years' success with vertical retorts in the shale-oil industry, where the conditions were favourable. With regard to the future prospects of vertical retorts, the conditions which made it possible to be a success in every-day working were still growing strong and looked like continuing; and therefore he was convinced that a great future was before vertical retort carbonization, not only for small works but also for the largest. In some works like those at Sheffield, where they could keep (say) 24 beds of through horizontal eights charged practically as full by the aid of machinery as was done in the vertical retorts, it was claimed that the results obtained compared favourably with those from vertical retorts. This, however, he ventured to say was discounted when full value was credited to vertical retorts for improved value and quantity of residual products. The make of gas was practically free from naphthalene; there were no stopped ascension-pipes; the mechanism of the machinery was simple; and above all there were fewer men required to work them. He, like the late Sir George Livesey, had been a believer in not displacing the man and shovel, and in paying more than a living wage, unless a very substantial saving could be shown by doing so. But in these days of unreasonable and autocratic labour, unrest and troubles growing more acute each day, it behoved all employers of labour to look ahead, particularly so employers who produced a commodity like gas, which was an every-day necessity. For this reason, he thought that employers were that day justified in putting the capitalized value of the men's wages into new plant and machinery, even if at the beginning no saving could be shown. By doing so, they were then rendered more independent of labour, and more sure of their ground. Referring to the Cleethorpes installation, nothing on the part of the contractors alone and unaided could have produced such a plant. They as contractors had been privileged in having to deal with such a Board of Directors and such an Engineer as Mr. Brockway, who had been fired with patriotism and patience which had been of inestimable assistance to the firm in the design, development, and completion of the system. The courage on the part of a gas engineer in advocating the trial of an untried plant and machinery often went insufficiently rewarded. Yet on such gas engineers the future of gas development rested; and he therefore said that the gas industry owed a debt of gratitude to the Directors of the Cleethorpes Gas Company and to Mr. Brockway, their Engineer. On behalf of the firm he had the honour to represent, he had the greatest pleasure in acknowledging their indebtedness for the great assistance given, and thank them most heartily for their support. He should not like to conclude without mentioning the names of the patentees—Messrs. Toogood and Brooke—who had given a great amount of time and study to this system. He again thanked Mr. Cook for his kind remarks; and the Chairman and Directors collectively for the handsome walking-stick, which it would ever be his pleasure to preserve.

Mr. Toogood (for whom there were repeated calls) said he could only thank all present on behalf of Mr. Brooke and himself, and all others who had been associated with the new plant. To have been instrumental in the design and development of this new installation was indeed a great privilege. When success attended those efforts, then all labour and anxieties were fully compensated by the extensive and valuable experience gained. On behalf of his colleague and himself he thanked Mr. Broadhead for his acknowledgment, and assured him that its influence would be to stimulate to further endeavour.

Mr. George E. J. Moody proposed the toast of "The Visitors." In the course of his remarks he spoke of the tremendous progress that the gas industry had made. He could remember when gas was 5s. per 1000 cubic feet in Cleethorpes, and now it was only 2s. 2d. He was also very much struck with the quantity of gas obtained from a ton of coal; and, with the progress of new practices in the gas industry, he could see prices being further reduced and dividends further increased. He and his colleagues were pleased to see their visitors that day; and he hoped it was not the last time they would have visitors to see developments in the Cleethorpes Gas-Works.

Mr. Robert Watson (Doncaster), in replying for the visitors, said they desired to thank their hosts for their exceeding great kindness in giving them the opportunity to visit Cleethorpes, and to see what Mr. Brockway and Mr. Broadhead had been doing. He visited Cleethorpes at the time Mr. Brockway had under trial the Settle-Padfield verticals; and he had been very interested in hearing what Mr. Brockway had to say in that connection. When he received the invitation to be present there that day, in view of the recollections he had of this previous time, he thought with Dr. Johnson, when referring to a widower friend of his who had married a second time, that this was a case of the triumph of hope over experience. He (Mr. Watson) was glad to think that every visitor there that day would bear him out when he said that the installation they had seen was ample justification for the scheme that Mr. Brockway had suggested to his Directors. He had an excellent installation, which would achieve much good for his Company, for himself, and for the gas consumers of Cleethorpes. There were, of course, several systems of vertical retorts in operation in the country; but, as Mr. Wood had said, there was room for them all. Those who were looking forward to carbonizing extensions in the immediate future were watching with considerable interest and anxiety every installation that was being erected; and the Cleethorpes installation was one that would have to receive consideration among the others. He was glad to hear Mr. Brockway say that the guarantee of results had been exceeded. This was a good sign as to the excellence of the work done; and that he was selling gas in Cleethorpes at 2s. 2d. per 1000 cubic feet was an excellent indication of commercial prosperity. As visitors, they were all pleased with these signs. The Chairman had referred to the good work that the gas organizations of the country were doing. They were working not merely to cheapen the manufac-

ture of gas and the cost to the consumer, but to further its use. They as gas men knew the numerous and the best ways in which a consumer could use gas; but, unfortunately, the consumer himself did not know. They were at the present time, through the newly-formed British Commercial Gas Association, trying to advertise gas not only for lighting, but for heating, to the financial advantage of both the consumer and the gas supplier. They hoped and expected that very great good would result from the work that was being done through the new Association. Most of the gas undertakings in the country were taking their share in furthering this good work; and, as a visitor, he ventured to hope the Cleethorpes Gas Company would join the movement. Speaking as a member of the Executive Committee of the Association, he could only say that the Committee would very cordially welcome the help of the Company. On behalf of the visitors, he sincerely and warmly thanked the Chairman and Directors for the opportunity they had given them for inspecting the new vertical installation, and for their hospitable entertainment.

Shortly afterwards, the party broke up; and an extremely interesting visit to Cleethorpes, and to the works of the enterprising Gas Company, came to an end. Before trains left, most of those present had time for a walk along the front to enjoy the bracing air of this popular Lincolnshire seaside resort.

TESTING THE LIGHTING AND HEATING VALUE OF GAS.

In another part of the "JOURNAL" will be found the first portion of a lecture delivered by Dr. E. B. ROSA, the Chief Physicist in the Bureau of Standards of the United States Department of Commerce and Labour, on the occasion of the recent Gas Centenary celebration at Philadelphia (Pa.). The second portion of the lecture was devoted to the subject of testing the lighting and heating value of gas; and the following are extracts from it.

CONTROL OF ILLUMINATING GAS SUPPLY IN THE UNITED STATES.

Among the industries conducted by public service companies, none has been for so long a time and in so great detail subject to legal requirements and restrictions as the gas business. The value of the service rendered by a gas company depends on the quality, quantity, and condition of the gas delivered. Many elements besides the energy content of the gas go to determine good or poor service. These various elements are enumerated more or less completely in many of the gas ordinances now in force. These ordinances, therefore, are sometimes very technical and detailed in character; in other cases, however, they contain very meagre specifications. The process of adopting a new ordinance is often long and painful, as no recognized single standard of quality, purity, and pressure has ever been set up. Indeed, the conditions are so various in different places, that a single standard is impracticable. It was on account of this, and because so much difference of opinion existed among engineers and experts as to what could fairly be required of a gas company under a given set of conditions, that the Bureau of Standards about two years ago undertook a careful study of the subject of State and Municipal regulations in regard to gas.

A compilation of the State laws and City ordinances in force in America was first of all made, and their technical requirements tabulated. A detailed study was then undertaken of the various features of these laws, and an attempt made to formulate a law that should contain reasonable standards of the quality, purity, and pressure of gas, and a reasonable set of operating requirements. In this study, a large number of the best informed gas experts in the country were consulted, either personally or by letter; and many gas plants were visited by a representative of the Bureau. In this work, the Bureau has been greatly assisted by the responsible officers and members of the technical staffs of gas companies, both large and small, and by members of public service commissions, gas inspectors, and consulting engineers. The Bureau has endeavoured to consider all sides of the various questions involved, and has, of course, received very conflicting opinions on some questions. It has been a source of great gratification to those conducting this investigation to see the fairness and broad-minded spirit shown generally by representatives of the gas companies in discussing questions which affected them so vitally.

The results of this investigation have been recently published in one of the technical circulars of the Bureau of Standards,* and it is our hope that it may be of great value both to City and State officials and to the gas industry in the preparation and revision of rules and laws controlling the distribution and sale of illuminating gas. The position of the Bureau in this matter, as in so many other, is advisory. It has no legal authority to enforce its conclusions, and no disposition to suggest federal legislation or regulation. It acts as an unbiassed co-ordinating agency, to formulate the consensus of opinion of those best qualified to express opinions on technical questions of great practical importance. If the work be well done, it will carry great weight; otherwise, very little.

A second investigation is in progress, and will be embodied in a separate publication. It will have to do with the methods and instruments employed in testing gas for its heating value, its photometric value, and its chemical purity, as well as in testing meters and measuring gas pressures. This will be designed to assist gas inspectors and engineers in determining whether the gas meets the specifications under which it is sold. A large amount of experimental work is being done at the Bureau, in testing methods and instruments, and in some cases improving both; and the results of this work will be ready for publication, it is hoped, some time within a year. This circular will be much more comprehensive than the "Notification" of the Metropolitan Gas Referees. The latter is accepted as authoritative not only in London but also elsewhere — to some extent even in the United States. It is hoped that the publications of the Bureau of Standards on gas testing may come to be regarded as authoritative, and may prove to be of real value to the gas industry. To this end the Bureau is carefully studying the various questions involved, and seeking advice and information from many sources.

* The circular referred to has been dealt with in the "JOURNAL." [See *ante*, pp. 501, 576, 634.]—ED. J.G.L.

TESTING ILLUMINATING POWER, QUALITY, AND PRESSURE.

The candle power of a gas refers to the candle power of a luminous flame as the gas issues from a specified burner at the rate of 5 cubic feet per hour. This is measured by comparison with some kind of flame standard; candles being the most used but least reliable standard. The pentane lamp is probably the best flame standard employed, in spite of its serious limitations. Oil-lamps may be used safely, if only moderate precision is required, provided they are frequently calibrated and used with care. But inasmuch as mantle lamps are so largely employed in lighting, and gas of high candle power is not necessary for them, less importance attaches to photometric tests for bare gas-flames than formerly, and less stringent requirements may be made as to the illuminating power of the gas so measured. It is thus possible to obtain a given heat value and a better lighting service when using mantles at an appreciably smaller cost of manufacture of the gas. But though the photometric testing of gas is less important than formerly, the photometric testing of mantles and of other lighting appliances is more important than heretofore. The gas company can do much good by encouraging the use of good appliances, and many of the larger companies have adopted very progressive methods in this respect. The public need information as to the best use of light (both gas and electric) in homes, in stores and factories, in public buildings, and on the streets; and the lighting companies can do much good in this direction. An immense variety of gas appliances are used for household and industrial purposes; and here again the gas company can do much good by encouraging the best and safest, and setting a high standard in the matter of connecting such appliances. The standardizing and testing of these appliances and the materials used in connection with them, and the careful determination of their efficiency and performance, are quite as important and practicable as the measurement of the efficiency of gas burners or mantles.

It is very important to have the gas free from such impurities as sulphur compounds and ammonia; and tests and penalties are usually prescribed to insure reasonable freedom from such impurities. Gas companies find it to their advantage to comply with such requirements; the tests are easily made, and offer comparatively little trouble in the administration of the law. It would be desirable, and to the interest of the companies, if still greater freedom from these impurities could be economically attained.

One of the most important features of good gas service is a nearly uniform pressure, neither too small nor too great; and yet the tendency is towards higher pressures. It is also one of the most difficult conditions to meet, as is likewise the case in the distribution of electricity for lighting purposes. In both cases, heavy mains, feeders, boosters, and storage tanks or batteries are or may be employed to aid in maintaining steady pressures. But whereas the gas company enjoys an immense advantage over the electricity company in its gasholders, it suffers a disadvantage due to the clogging of service-pipes, and sometimes to differences in altitude of various parts of a city. Heating as well as lighting appliances require adjustment to suit the pressure; and after such adjustment has been made, serious variations of pressure are detrimental to efficiency, and may even be dangerous. Hence pressure limits are set in regulatory ordinances, and measuring the pressures at various parts of a city is one of the duties of a gas inspector.

MEASUREMENT OF THE HEATING VALUE OF GAS.

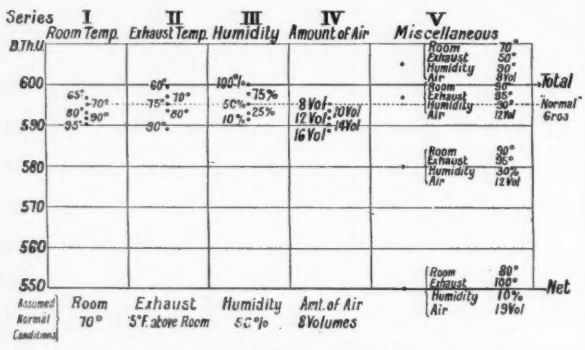
Gas is used for the production of light, heat, and power. For heat and power, and largely for lighting as well, its value is determined by the amount of energy it contains, and by its condition as respects pressure and purity. Its energy is measured by burning samples of the gas in a calorimeter, for which purpose several different forms of instruments are available. The Committee on Calorimetry of the American Gas Institute have done very valuable work in testing different forms of calorimeters, and in showing how they may be used in giving reliable results. The Bureau of Standards has also been making an experimental study of gas calorimeters. In the usual type of calorimeter, the gas to be burned and the air to support combustion are admitted at the room temperature; while the products of combustion are cooled substantially to this temperature before escaping—these products all being gaseous, except that a certain amount of aqueous vapour is condensed and collected as water. The heat measured by the calorimeter under these conditions is called the "gross" heating value of the gas. If the heat of condensation and cooling of the

aqueous vapour condensed and collected is subtracted from the gross heating value, the remainder is called the "net" heating value. Usually gross heating value is named in city ordinances and in rules of State Commissions (where a calorimetric test is required); and it is commonly, though erroneously, believed that it can be as accurately measured as the net value. [The lecturer dealt with this matter in some detail.]

The total heat and the net heat depend only on the gas itself, and are wholly independent of the condition of the atmosphere and of the quantity of air passing through the calorimeter (if there is enough air to ensure perfect combustion). The gross heat, however, is a variable quantity, depending upon both of these factors as well as upon the gas itself. If, for example, a certain gas has a total heat of 600 B.Th.U. and a net heat of 550 B.Th.U., the gross heat as measured by a calorimeter may be anything from 550 to 600 (or may be outside these limits in extreme cases), according to the temperature and the atmospheric humidity at the time of the measurement and the quantity of air passing through the calorimeter. The net heating value is therefore a truer measure of the quality of the gas than the gross. It is the latter, however, which is used generally as a test of the quality of the gas. Hence, even if the calorimetric work be correct to within 1 per cent. (and the net heat determined within 1 per cent.), the result may be in error by several per cent. if the gross value is used. Since the object of the work is to test the quality of the gas, the result should, of course, be independent of the state of the weather.

A calorimetric test of gas may be regarded from two different points of view. According to the first, the test gives the heat value of the gas per cubic foot measured under standard conditions of temperature, pressure, and water vapour content. The total or net value of this heat depends only upon the composition of the gas, and could be calculated if we knew its chemical composition. The gross value, as usually measured and defined, depends to some extent on the atmospheric conditions and other circumstances of the test. It is not as true a measure of the quality of the gas as the net heat. According to the second point of view, the calorimetric test should give the heat value of a cubic foot of the gas as nearly as possible as delivered to the customer; and hence the correction for temperature and pressure should not be to 60° Fahr. and 30 inches of barometer, but to the mean annual meter temperature and pressure of the city where the gas is sold. Then if a uniform heat value were required, the gas would be made of sufficiently higher heating quality in a city of greater altitude or higher mean temperature than the average, to set off the effect of smaller density. It may be urged that such corrections tend to complicate the sale and distribution of gas, and that the present methods are good enough in these particulars to be left alone. But I think this is not a correct view. What is the logic of trying to keep meters free from accidental errors greater than 2 per cent., and of trying to make calorimeter determinations correct to 1 or 2 per cent., if constant errors of 2 to 5, or even 10 to 15, per cent., or more—due to a low barometer or to a higher or lower mean temperature than the average—are ignored?

Of course, it is impossible to test the gas at each meter; hence the most that is practicable is, as already stated, to reduce the result to the mean meter temperature and mean barometric pressure of the city where the gas is distributed. These are not difficult to determine, at least approximately, and it would appear not impracticable to carry out such a method. In order to illustrate how the gross heating value, as usually defined and measured, varies under different conditions, the total and net heat being always the same (600 and 550 B.Th.U.) for the same gas, I give a number of examples.



Variations of Gross Heating Value with Conditions.

[Gas having a Total Heating Value of 600 B.Th.U., and a Net Heating Value of 550 B.Th.U.]

NOTE.—In the above calculations, only the variation due to the latent heat of the uncondensed water is considered.

These examples will show that gas of a total heating value of 600 B.Th.U. and of a net heating value of 550 B.Th.U. may have a gross value anywhere between these figures, according to the state of the atmosphere and the rate at which air passes through the calorimeter, though under usual conditions the variation is relatively small.

SUGGESTED NEW STANDARD.

If it is granted, in view of the foregoing considerations, that the net heat is the proper quantity to specify as indicating the quality of the gas, the practical difficulty remains that in many ordinances and rules a gross value of 600 B.Th.U. is now specified, and it is difficult to alter established practice. Even if a change could be readily made, 600 B.Th.U. sounds better than 550 B.Th.U.; and some feel that the latter figure does not give gas manufacturers credit for all the heat they have put into the gas. This difficulty, and the practical one of changing established rules, can be largely overcome by allowing the gross value of 600 B.Th.U. to remain in the rules and ordinances, but to add by way of amendment that for purposes of test 550 B.Th.U. net (or whatever is found to be equivalent) shall be construed as equivalent to 600 B.Th.U. gross. This would give at once a fixed standard more satisfactory than the present gross or even a normal gross, and would at once remove one of the most serious objections to the present practice of gas calorimetry. To correct the measured net heat to the mean annual meter temperature and mean annual barometric pressure of the city where the gas is distributed, instead of to 60° Fahr. and 30 inches barometer (or to omit the correction for barometric pressure altogether), would be the next logical step in putting the calorimetric testing of gas on a more scientific basis.

The two changes suggested are, however, too important and too far-reaching to expect that they could be agreed to and put into practice immediately. I suggest that a Committee of the American Gas Institute, working in co-operation with the Bureau of Standards, might give the matter careful study, and report their findings to the Institute and the public. I believe that the Institute and the gas interests at large would favour the adoption of such changes in practice, if on careful study they appeared to be just and practicable. To do so would be in harmony with the present tendency to adopt uniform standards of gas quality, in order that 1000 cubic feet of gas would mean the same thing in actual service as nearly as possible in different places. The Bureau of Standards has not suggested these changes in its recent publication. In the next, however, on testing methods, these questions will arise; and in studying them the Bureau hope for as cordial co-operation from the gas interests as they gave in the first investigation.

Testimonial for High-Pressure Lighting.

Some time ago, the Gas Engineer and Manager of the Hereford Corporation (Mr. W. W. Townsend) fitted up at the premises of Messrs. James Baker and Sons, Limited, in the High Street, Hereford, an installation of high-pressure gas lighting. It consisted of three lamps, each of 1000-candle power, outside the shop, and a similar number of 300-candle lamps inside. Mr. Townsend has lately received from the Director (Mr. A. F. Baker) a letter in which he expresses the firm's entire satisfaction with the installation, from the point of view both of efficiency and economy. They find their payments for the year amounted to £6 16s. 7d. This is the cost of gas only; maintenance charges being additional. As the firm have 34 branch shops in different parts of the country, they are necessarily in a position to make very careful comparisons of all the methods of lighting; and they have no hesitation in saying that the high-pressure gas installation at the Hereford branch is "by far the cheapest, and at the same time the most brilliant and thoroughly satisfactory," lighting installation they have.

Railway Carriage Lighting by Gas in Russia.—According to "La Technique Moderne" for last month [May], a new incandescent gas-burner has been in use for some months in Russian railway carriages, on the Moscow-Kazan line. The new burner, which is on the Novojenoff system, is mounted on the ordinary fittings; and the following advantages are claimed for it: (1) Low first cost. (2) The igniter does not act when the mantle is incandescent, resulting in a saving of 8 litres (0·28 cubic foot) of gas per hour. (3) There are fewer parts than in other systems. (4) No supervision is needed, and repairs are not required till after a year's use. (5) The support for the mantle is solid. The mixing-tube has an air-regulator which prevents the mantle smoking.

The Water-Meters Question in Philadelphia.—For about seven years the use of water-meters has been prohibited in Philadelphia, even where a consumer has been desirous of having one installed. Probably there is no other important city in America where such a prohibition exists; and, according to "Engineering Record," a strong attempt is now being made to have the ordinance revoked. The reason for this desire on the part of the administrative officials of the city is the early approach of the time when very heavy expenditures for new plant must be incurred, unless the present waste of water is checked. It is stated that those who have long opposed this method of obtaining their supply, change their views after a trial of it. This has been well shown in Washington, which long held rank with Philadelphia as an opponent of metering, but now holds a decidedly different opinion as the result of only a few years' trial. It has learned there is nothing about a meter which curtails the most lavish use of water. It is only when a man begins to throw it away that he finds the meter a check; and then a check ought to be applied. If it is not, the great majority of the consumers must pay for the waste caused by a small number, which experience shows is generally about 10 per cent. of the whole.

THE RE-CONSTRUCTIONS AT THE SOWERBY BRIDGE GAS-WORKS.

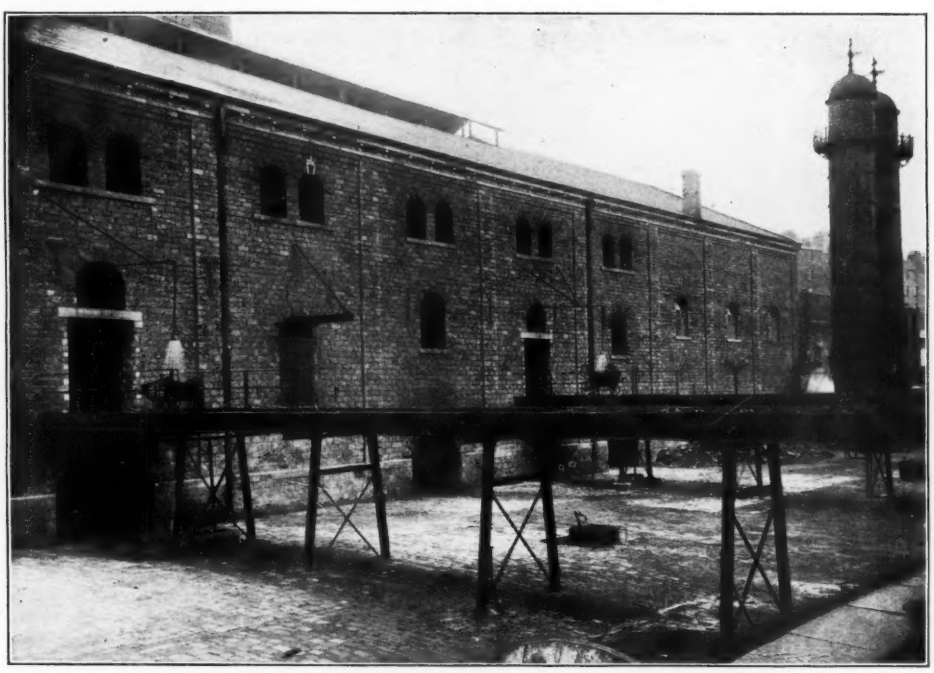
When Mr. A. W. Bissell was appointed to the charge of the Sowerby Bridge Gas-Works in 1902, a vista of urgently-needed renewals and reconstructions opened up before him. The local authorities had set themselves to reduce their indebtedness to the lowest possible point—to scrap nothing that retained any possibilities of service, and thus to postpone reconstruction as long as possible. There were two independent works, the settings of which were direct-fired and hand-charged, and the general condition of which was approaching dilapidation. The mains of the two districts were not linked-up, so that gas making would have to be continued at each during any alterations; and extension, renewal, and enlargement of mains was becoming imperative. The Sowerby Bridge works had a nominal capacity of about 800,000 cubic feet per day, and the Luddenden Foot works, about 4 miles further up the Calder Valley, could turn out about 200,000 cubic feet per day.

Mr. Bissell attacked his problems in the following order. First he erected new offices and a smithy at Sowerby Bridge, and installed new station governors. Then he modernized the more distant works at Luddenden Foot, putting in new regenerative settings, new scrubbers, and a new holder. The district then claimed attention, and some 12 miles of mains were laid—mainly replacing old and smaller ones. The districts served by the two works still remain independent; the cost of linking them being very much higher than the advantages seemed to justify. Afterwards he attacked the major problem of an entire reconstruction of the carbonizing and condensing plant at Sowerby Bridge, on the same site, without any interruption of gas supply.

Retort-House.

The old retort-house contained 16 beds of seven single retorts, 9 feet long, arranged back to back. Among the retorts were both oval and round sectioned retorts, as well as Ω's. In all, there were five different sizes. The two hydraulic mains running the full length of the bench were supported on the brick-work of the bench and were much out of level; while a photograph hanging in the Manager's office gives a view looking down the old retort-house just above the level of the top of the ascension pipes, and shows truly remarkable variations of these from their original vertical position. The roof was in two spans; the valley gutter being also a girder and actually supported on top of the retort-bench. The walls were in places 18 inches out of plumb in a height of 36 feet; and fear of their collapse during reconstructions was an ever-present incentive to speedy work.

The work of reconstruction was begun in February, 1911, and practically finished the following October; the supply of gas to a district of 27,000 inhabitants being maintained without interruption. The new retort-house is on the same site and practically on the same foundations as the old one. The old foundations were of good strength, as necessitated by the works being bounded by a canal along one side and a river along the opposite one; the works being at an intermediate level also. The work was entrusted to Messrs. Drakes Limited, of Halifax, who sublet to local contractors the slating, plumbing, joinery, and part of the building work.



THE NEW RETORT-HOUSE AND COKE-HANDLING PLANT AT SOWERBY BRIDGE.

Carbonizing Plant.

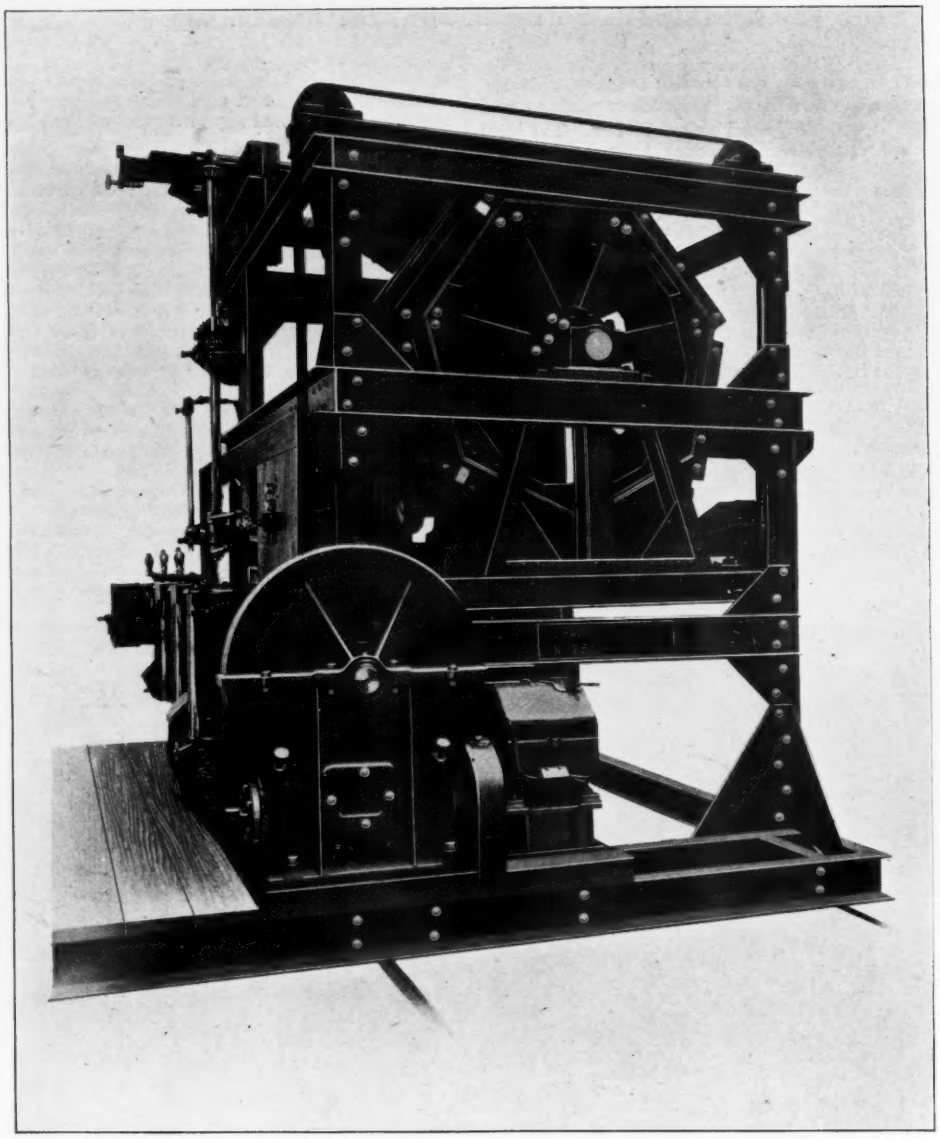
The new carbonization plant is composed of eight settings of eight through retorts, 20 feet long, of Ω section, 22 in. by 16 in., with Drakes' patent tube regenerator settings. They are arranged in two benches, provided with steel tar-towers 24 in. by 12 in. by 16 ft. 6 in. high, worked in the ordinary fashion and fed by a 6-inch tar-main, into which each of the four sections of the hydraulic main opens. A noteworthy feature of the setting is that ascension pipes are provided at only one end of the 20-feet retorts. All the gas, liquor, and tar accessories are thus at one side of the house; while the combined charging and discharging machine, the coal-storage hoppers, and the elevating and conveying plant are on the other, adjoining the canal along which all the coal is brought to the works. This arrangement gives the house a workman-like, uncrowded appearance, is economical, and has proved quite effective; while the few inches saved in the mouthpieces upon the charging side was an important gain for the arrangements of a house which would have been wider but for the desirability of utilizing the old foundations.

Coal-Stores.

Continuous with the retort-house are two coal-stores—the nearer one of height and width equal to the retort-house, and the farther one narrower. Into these the coal is carried by hand from the boats in the adjoining canal—a 60-ton cargo being handled in eight hours. Storage is provided for 1700 tons, equal to the needs of five weeks' midwinter working—the former storage being only about 900 tons. Though at first sight this method of unloading the boats seems strangely out of keeping with the up-to-date arrangements of the carbonizing plant, Mr. Bissell, having gone minutely into the costs of alternative systems, is convinced that mechanical transport would saddle him with a higher annual charge than the present system.

Coke Handling.

For the same reason no coke conveyor has been installed. Usually the coke is received into barrows, each large enough for the reception of the full charge from the retort, wheeled on to one of two gantries which lead from the drawing stage level right across the yard. The coke is slaked immediately outside the house by an overhead rose, and then wheeled down the gantry. Hot coke can also be discharged through shoots in the stage floor, caught in barrows on the clinkering floor, wheeled out, and slaked on the yard level. Though the existing coke yard is of just the same size as formerly, more coke can be stacked, because most of it is brought out at a height of some 8 feet above the ground level, and so can easily be piled to a greater height. This will be a great gain to the undertaking. So far, the Manager has had a local sale of 75 per cent. of his coke; the demand being an increasing one. The main reason for any being sent away has been the congested state of the yard in February; so that the better storage facilities for coke points to the possibility of all the coke being disposed of locally. A considerable saving has incidentally been effected in connection with the alterations. Formerly town's water had to be used for coke slaking; now the collected and



SIDE VIEW OF THE RETORT CHARGER-DISCHARGER.

stored rain water is employed. The surplus that drains away is also utilized; and this source of supply seems likely usually to be adequate for the purpose.

Foul Main, Condenser, &c.

The gas from each bench is collected in a 15-inch foul main. These meet in the centre of the house by the chimney, and are continued as an 18-inch main across and up the house, down its full length again, then down the cooler, but still sheltered, coal-stores, so as to ensure slow cooling, and finally along the outside of the walls for a final 25 yards to the new battery of six annular condensers. These are 27 feet high, 3 ft. 6 in. external, 2 ft. 6 in. internal diameter, and have 18-inch connections and bye-pass. Each bench has a Braddock's counterbalanced retort-house governor in its foul main.

Tank for Water, Liquor, and Tar.

Over the more distant and smaller coal-store is a new large cast-iron tank, 92 ft. by 40 ft. by 5 ft. deep, divided into three equal compartments for water, liquor, and tar. The liquor is usually worked-up on the works in the immediately adjoining sulphate plant; while the tar is run from the tank into boats on the adjoining canal, and thus sent away.

Conveying and Elevating Machinery.

From the end of the coal-store next to the retort-house, the coal is raised from the breaker by a bucket elevator and delivered on to a push-plate conveyor, which feeds the continuous storage hoppers along the full length of the retort-house on the charging side. These, in all, hold about 120 tons of coal—sufficient for 1½ days' working in midwinter and four to five days' in summer. The engine for working these is housed in close proximity to its work under the charging stage. This is rendered possible because, as only one furnace is provided for each through setting, all the space under the charging stage and on the clinkering floor level is available. A small part is utilized as an enclosed engine and dynamo room; while the rest is a warm, dry store available for pipes, &c. The placing of the engine in this situation economizes room, and gives it a firm foundation. Head room may seem a little less than usual; but lowering the floor would probably have led to trouble with water from the adjoining canal.

Power Plant.

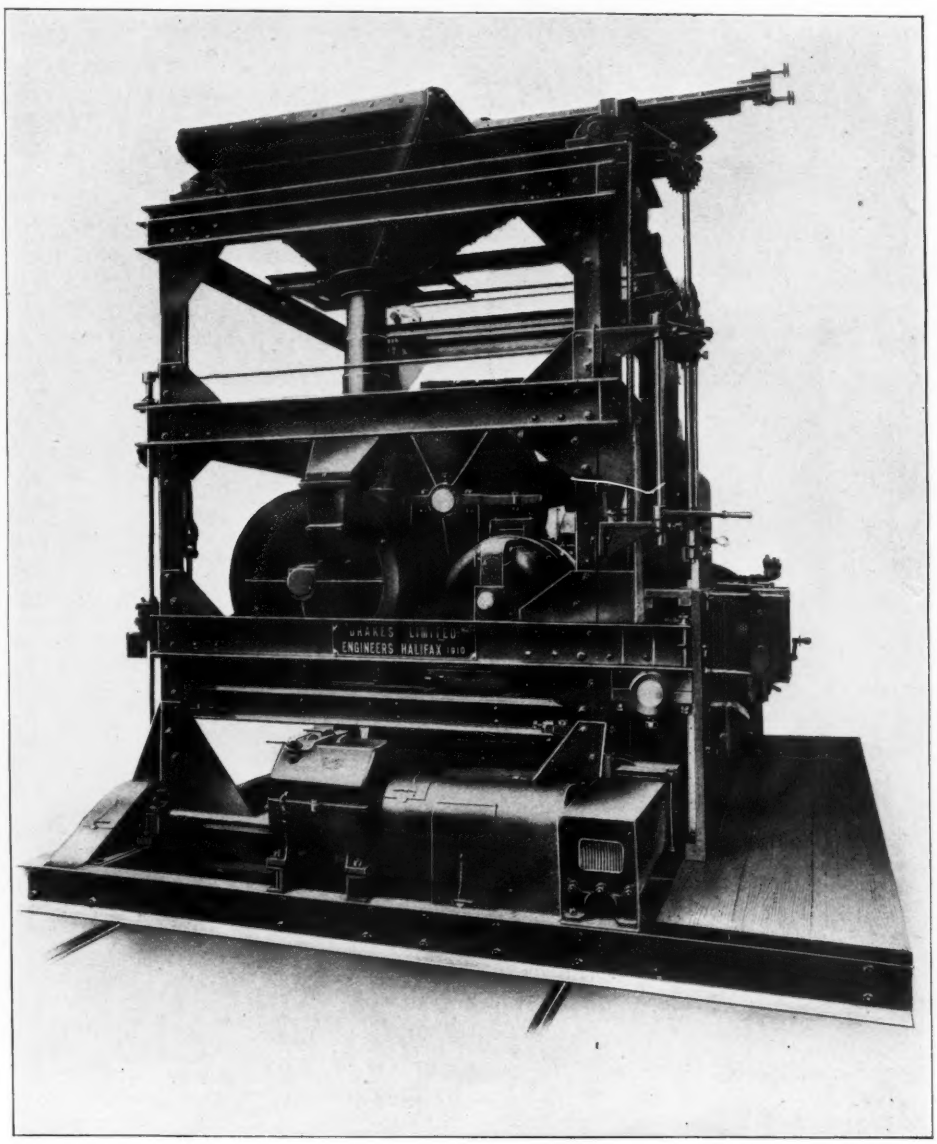
The engine is a 60 H.P. gas-engine, working at 230 revolutions per minute. In addition to operating the breaker, elevator, and conveyor, it drives the dynamo which generates the electricity for the combined charging and discharging machine. The dynamo is a compound wound one, belt-driven, working at 800 revolutions per minute, and giving a 16 kilowatt current of 230 volts. The switchboard and all necessary electrical connections are in the engine-room.

Mess Room, Lavatory, &c.

Cut out from the upper portion of one side of the main coal-stores is a continuous set of three rooms, reached by a short flight of stairs from the working stage of the retort-house. These are a very neat and comfortable mess room for the stokers, a well-fitted lavatory and bath room, and the mechanic's work-shop, with independent additional means of access from the yard by means of an iron staircase. The kindly interest taken in the men and the consideration shown to them (which is a marked feature of the relations between the Gas Committee and their employees) is reflected in the comfort and general arrangement of these rooms, which are a notable feature of the new works.

Stoking Machinery.

To the visitors at the opening ceremony, as to many who will subsequently see the works, the chief interest centred in the working of the combined charging and discharging machine patented and constructed by Messrs. Drakes, Limited. This is no hastily-devised arrangement, but in various forms has been steadily tried under experimental and under ordinary working conditions for the past four years. Some information as to its special features has appeared in our "Register of Patents" (Vol. CIV., pp. 212-13).



THE OTHER SIDE OF THE MACHINE.

Sowerby Bridge, however, possesses the first combined machine the firm has erected. Although the lay visitors at the opening ceremony spoke of it as ponderous, gas representatives familiar with other stoking machines, especially of the combined type, promptly commented on its being less bulky than most others. The feature that next attracted attention was that every operation, except, of course, opening and closing the retort lids, was carried out by the one operator without ever leaving his platform, including even the manipulation of the slides on both the storage and travelling hoppers. Not only so, but the parts had been so arranged that the man had no difficulty in seeing, without moving from where he stood with his hand on the levers, whether or not his machines were true to the position of the retorts they were about to deal with.

The total dead-weight of the machine is 14 tons, while the weight hanging on the platform is 6 tons, and is suspended from four $\frac{3}{4}$-inch wire ropes of flexible "Plow" steel. It is worked electrically; current at 230 volts being picked up from an overhead wire in the usual fashion. All wires are placed out of the operator's reach behind boards, so that no electrical harm is possible to him short of climbing up and clutching the overhead live wire. Four wires lead to the discharger and three wires to the charger.

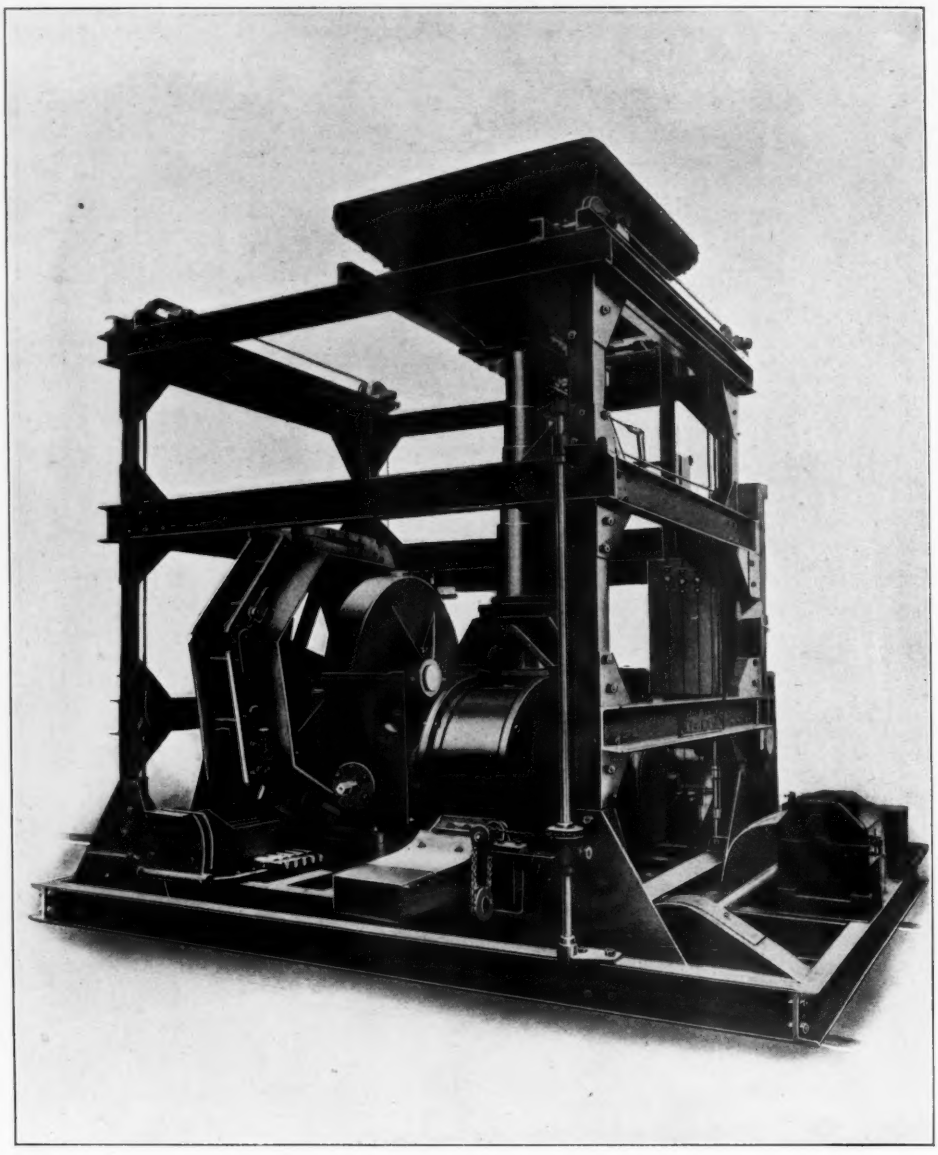
The machine has four totally enclosed motors—one each for the charging and discharging mechanism, 8 H.P. and 10 H.P. respectively, one for the travel, and one for lowering and raising, each 7 H.P. In case therefore of one breaking down, the others are unaffected, and go on with their work. When any one of the four motors does break down, the working mechanism can at once and easily be operated by hand, except that, of course, it will be difficult to get up speed for the charger. The same handle will fit all four shafts. Three of the motors are operated by a similar control to that of a tram-car; and the man has only to move a lever to one side or the other. For the charger, he has to cut off current in the usual way in order to reduce speed. The most notable tribute to the simplicity of the machine's operations is that the three men whom Mr. Bissell has trained to be available for working it were ordinary hand-charging stokers a few months ago, and not even young ones either. They have taken to the work readily and kindly, and have been giving every satisfaction for some months past in their handling of it.

The machine travels on four wheels, two of 9 inches and two of 15 inches diameter; the latter attached to the driving mechanism by spur wheels. A strong point is made of the fact that these wheels have a shaft only $8\frac{1}{2}$ inches in length; so that, in case of the warping of the lines exposed to the heat of the bench, any strain brought on this axle by the opening-out action of the travelling wheel will be so much less serious than in the case of an axle extending the full depth of the machine. The travel of the machine is 90 feet per minute.

The coal is fed from the base of one of the continuous hoppers into the travelling hopper on the machine. To each setting there are three openings from its own storage hopper; so that at whichever of the three vertical rows of retorts the charger is standing it is in position for at once getting its supply of coal. Directly in front of the operator as he stands ready for charging, and a little above the lever arm of the charger, are two levers of a different design, and of differing lengths, by which, without moving from his position or looking away from his retort, he can manipulate the slides on both the hoppers—that on the storage hopper being opened by a cast-iron quadrant and rack. The travelling hopper holds 12 cwt. as usually filled, but 15 cwt. if filled level.

The Charging Machine.

The charging-machine consists of a cast-steel disc of 3 feet diameter placed vertically in an enclosed case and revolving on its centre. Attached radially to its outer portion on both sides are mild steel vanes, $5\frac{1}{16}$ inches in depth. The coal is delivered by a "breeches" pipe from the machine hopper and delivered in front of these vanes, accumulating to a depth of about 4 inches. By the centrifugal force attained as the vanes revolve, the charge is hurled along the retort. As there is nothing flexible to stretch



THE FRONT OF THE MACHINE, NEXT THE RETORT BENCH—SHOWING THE DISCHARGING RAM AND CHARGING SHOOT.

and hang limp, the direction of the travelling charge is always the same, and there is no fear of its missing the retort in part. Rather than fall into the retort and thus pile up a charge from above, from this machine the coal travels near, or along, the bottom of the retort and piles up. Risk of damage from the presence of foreign matter getting among the coal is guarded against—first, by a flap door that can be lifted on each limb of the breeches pipe, and a plate that can be unscrewed; and, secondly, the fear of a large solid wedging between the vanes and the casing is almost entirely removed by the fact that the coal is delivered in front of the vanes. As a matter of fact, the Contractors have passed shovel-heads down with the coal and had them safely deposited in the retort without damaging the machine. With the stop-plate out, they were simply flung clean through the retort and out of the retort-house. The weight of charge delivered is under complete control—an even layer is easily secured. Full charges can just as easily be installed and without any need of absolutely blocking the retort, provided it is in good condition and not irregularly "carboned." At present, twelve hours' charges of 12 cwt. each are being worked, but 15-cwt. charges have at times been successfully dealt with.

The working gear is a cast-iron disc on to which is bolted a phosphor bronze rim, in which works a mild-steel worm enclosed in an oil-bath.

The Discharging Machine.

The discharging machine consists of a 4-feet pusher-head, attached to eleven links, 2 ft. 6 in. long, which open out to a rigid pusher that remains horizontal, and, to avoid damaging the retort, always rides clear of it. When drawn in, these links wind round a polygonal wheel. Two ingenious devices call for special mention in this connection. To avoid using a very large drum as one of eleven 2 ft. 6 in. sides would be, the drum is much smaller in diameter, and has only seven sides, but as the two sides of the links approach one another in the direction of the ram-head, the eighth link lies inside the first, the ninth inside the second, and so on. Secondly, no water is used to cool the ram-head; and there did not seem to be any sign that any was needed. To secure rapid dissipation of heat, the ram-head consists of plates, 7 inches wide and ½ inch thick, to the end of which the actual ram-plate is attached. The total length of links and ram-head is 31 ft. 8 in. The power is, of course, connected to the drum. This is provided on each side with fourteen push-horns, fitted with hard-steel rollers, which work against hard-steel horns on the pusher-chain —three being bolted on each link—and thus push the link forward. The links are provided with hard-steel renewable sliding-pieces, which can easily be renewed as they show signs of wear and tear.

Efficiency and Cost of Working the Machine.

The discharger has been repeatedly timed. It takes 19 seconds to push out 10 cwt. of coke; the return stroke takes 15 seconds —a total of 34 seconds. The charger will deposit an even layer of 15 cwt. in 30 seconds. So that, allowing ample time for travelling, it is claimed that twenty retorts can easily be operated in an hour. At present, there is only one man at the machine side of the bench; and he has to strike and close the retort lids. Two men are on the further side, and deal with the coke. Although at present handicapped because full-sized coke-barrows have not been delivered, and the expulsion of the hot coke has to be interrupted to put a fresh barrow ready for its reception, still work proceeds expeditiously. The gang of three men have been timed frequently, and found to do twelve retorts in 45 minutes, when working under ordinary conditions and with no idea that they were being timed.

The cost of working the machine has been investigated, with results as follows: Using town gas for the gas-engine, with eleven times its own volume of air, and allowing 17 feet per H.P., or 28 feet per kilowatt, each unit of electricity developed cost 0·56d., or it may be expressed as 0·27d. per ton of coal handled. This covers all costs from the engine onwards—all power charges for the machine (the cost of placing the coal in the hoppers is excluded). Twenty retorts needed 6·7 units, costing 3¾d.

The retort-house is very light, cool, and well ventilated—a proof of which is seen from the fact that when the windows on the machine side of the house (which add so much to its appearance as the visitor approaches the works) were left unglazed, the men pressed their inquiries as to when the glazing was to be done, hoping it would not be delayed.

In the happy and unusual position of having an indebtedness of only about £6500 when the recent alterations were started—that is, of having a modernized works of a million cubic feet capacity with a total indebtedness now of only £21,500—the Sowerby Bridge gas authorities may look forward confidently to a period of gratifying prosperity. Some 80 per cent. of their gas is sold at the low price of 1s. 8½d. per 1000 cubic feet, and the steady growth of the output was crowned by a 9 per cent. increase last year.

At a time when the comparative advantages of the various methods of carbonization are so much exercising the gas industry, Messrs. Drakes and the Sowerby Bridge authorities, with their Engineer (Mr. Bissell), have contrived to show how economically and attractively settings of horizontal retorts can be combined with modern labour-saving appliances, and have here given a valuable object-lesson to any who may imagine that the older methods are played-out. Of a size that makes them a convenient standard of comparison, these works are likely to be frequently visited by those contemplating the recasting or extension of their manufacturing plant.

Formal Re-Opening of the Reconstructed Works.

The formal inauguration of the new plant at the Sowerby Bridge Gas-Works took place on the 23rd ult., when representatives of the District Council, of neighbouring local authorities, of the various contractors, and not a few managers of neighbouring gas-works, assembled, on the invitation of Mr. Sykes, J.P., the Chairman of the Council; and Mr. J. W. Whiteley, the Chairman of the Gas Committee.

Mr. Whiteley extended a hearty welcome to the visitors. He explained that they supplied gas to seven different authorities, and hence had realized their liabilities in maintaining an uninterrupted and adequate supply while re-erecting a new carbonizing plant on the same site as their old plant. They had been able to do it without any increase in the price of their gas; and as regards the price at which they supplied it in their own town, they were among the six cheapest gas-suppliers in the country. Mr. Bissell, their Manager, had put a lot of time and forethought into the work. He had formulated a scheme based on the best results in other districts, and Messrs. Drakes Limited had carried out their contract in a very business-like manner, to their full satisfaction and without either hitch or friction.

After Mr. Bissell had conducted the party round the works and explained the processes of gas manufacture, the new engine was started by the Chairman, and the subsequent working of the coal-handling plant and new "iron-man," as Messrs. Drakes' machine was promptly called, engaged the visitors' attention for a long time.

During the afternoon, Mr. J. Armitage Drake, J.P., the Chairman of Drakes Limited made a presentation to Mr. Whiteley of a silver rose bowl on an ebony stand, suitably inscribed, as a memento from the Contractors of the day's proceedings.

On the completion of the visit, the guests proceeded to the Council Chamber, where dinner was served. Over the subsequent proceedings the Vice-Chairman of the Council, Mr. E. Whiteley, presided. The chief toast of the evening, "Success to the Sowerby Bridge Gas-Works," was proposed by Mr. J. Armitage Drake, J.P., who, in the course of his remarks, stated that it was just 49½ years since he did his first day's work on these gas-works. He recalled the fact that it was 23 years since his firm began to experiment there with the newly-introduced gaseous-fired settings, and gave many other reminiscences linking his firm with the works. The late Resident Managing-Director of Drakes Limited was the son of Mr. Bissell's predecessor.

Mr. J. W. Whiteley, in reply, warmly complimented the Contractors and their own Gas Engineer for the satisfactory execution of the extensions, and bore tribute to the pleasantness that had marked all their co-operation. In sketching the developments of the works, he stated that gas was used in 1834 in one of the mills there. A Company was formed and registered in the following year who obtained parliamentary powers to purchase land, construct gas-works, &c. In 1856, the Local Board of Sowerby Bridge was formed; and in 1861 the Board purchased the gas-works for £18,396. During the next three years, an equal sum was spent in extensions and additions, and from time to time further expenditure was incurred. The total cost of the works to date had been £113,344, of which £109,942 was borrowed and £89,468 had been repaid; so that they were in the exceptional position of only having an indebtedness of £21,474, which included the £15,000 spent on the present extensions. They had now a works capable of producing 1,000,000 cubic feet of gas per day. In 1902, their output was 133,630,650 cubic feet. In 1912, it had increased to 169,539,600 cubic feet—an increase of practically 27 per cent.; and their works were now in a position to meet an equal increase in the next ten years. Earlier in the day he had stated that their net price of 1s. 8½d. per 1000 cubic feet inside the district placed them among the first six undertakings in the country for cheapness; and some of the Committee at least were of opinion that they might in the near future be able to give some reduction on the present charge of 2s. 4d. net to the outside districts.

Professor Burstall's Lectures.—We learn that it has been decided to postpone until the winter session the further lectures by Professor Burstall on "The Production of Power from Gases." The course, which was arranged by the Councils of the Midland and Midland Junior Gas Associations, comprises six lectures, four of which have been delivered. Abstracts of them have duly appeared in the "Journal"—two in Vol. CXVI., pp. 469, 752; and the others in Vol. CXVII., pp. 501, 795.

MIDLAND ASSOCIATION AT OLDBURY.

Spring Meeting.

Nothing but pleasant memories will remain to the large number of members of the Midland Association of Gas Engineers and Managers who assembled at Oldbury—the home of the President, Mr. Adam Cooke—last Thursday, on the occasion of the spring general meeting. A full day's programme had been mapped out; and, the weather being fine, the proceedings all through proved exceedingly enjoyable. To those who know Mr. Cooke, it is needless to say he was unflagging in his attention to the comfort of the visitors; and in this he was cordially supported by his Committee and other Councillors, and (in the final item on the programme) by Mrs. Cooke. Oldbury is a busy place, with all sorts of industries carried on its midst; and one sees that its public men are fully determined that it shall not fall behind through any fault of theirs.

A Welcome and Some Reminiscences.

Assembling at the Public Buildings, members were received in the Council Chamber by the Chairman (Mr. Charlie Thomlinson) and members of the Gas Committee.

Mr. Thomlinson, in welcoming the Association, on behalf of himself and his Committee, expressed the hope that the visit would prove a pleasant one. He said there were two old faces there that he was specially glad to see. One was that of their first Manager, Mr. F. J. North; and the other was that of his successor at Oldbury, Mr. Charles Meiklejohn. Mr. North left them in 1885 to go to Brazil; while Mr. Meiklejohn in 1892 received his appointment at Rugby. The next (and present) Manager at Oldbury was Mr. Cooke, who had been with them from the starting of the gas-works in 1881. He could assure them that Mr. Cooke had been a good, faithful servant of the public; and since he had had the management of the works many alterations and improvements had been made. Turning to the work of the Association, he remarked that it seemed to him that such gatherings as the present one created a social feeling among managers throughout the country. There were also, of course, other advantages. Wherever they went, even if the works did not happen to be absolutely up to date, there was always something for them to learn; and, on the other hand, those in charge of the works visited would gain from the experiences of members in regard to various matters connected with the apparatus. It must be admitted that at one period gas engineers thought they had everything their own way; but in course of time a competitor came along in the shape of the electric light, which was followed by the successful invention of the incandescent gas-light. Having thus met the competition in regard to lighting, the next thing gas engineers had to do was to turn their attention to the competition as far as cooking was concerned. The electrical engineers were working hard to oust the gas cooking-stove; and it was for the gas people to hold their own in the matter of cooking, as they had done in that of lighting. He thanked the Association very much for their presence, which the town of Oldbury regarded as a great honour.

Mr. Samuel Glover (St. Helens) said he had been asked to voice the thanks of the assembly to the Chairman and members of the Gas Committee for their kind invitation to Oldbury, and for the very hearty welcome Mr. Thomlinson had extended to them. They appreciated the words of advice the Chairman had offered, though they were unable to understand his seeming fear as to whether they might be able to hold their own with the electricians in regard to cooking. They had no doubt at all that their visit to Oldbury would be both pleasant and profitable; and they had great confidence that the gas undertaking would be successfully conducted under Mr. Thomlinson's chairmanship and Mr. Cooke's management.

The Stratford-on-Avon Explosion.

The President suggested that it would be the wish of the members to tender to Mr. J. S. Cranmer, of Stratford-on-Avon, their sincere sympathy with him in the recent accident at his works. If the Hon. Secretary (Mr. Harold E. Copp) would make a note of this, they would have accomplished their wish.

At the Gas-Works.

The visitors then proceeded to the gas-works (which are situated very near to the Public Buildings); and these they inspected, under the guidance of the President and his Assistant, Mr. J. W. Cooke. Oldbury is one of the places that were originally supplied with gas by Birmingham, but which secured a clause (at the time of the purchase of the Birmingham and Staffordshire Gaslight Company by the Birmingham Corporation) enabling them to purchase the rights and erect works for themselves. The Oldbury Gas Act received the Royal Assent in 1876; and shortly afterwards the Local Board of Health, under the chairmanship of Mr. B. T. Sadler, commenced to put up works, from plans prepared by Mr. Alfred Upward. The works, which were designed for an output of 40 million cubic feet per annum, were opened on the last day of the year 1881.

In a *souvenir* which was handed to the members on entering the works there was a table showing the progress made by the undertaking. For the first year in which the works were in operation

(1882) the quantity of gas sent out was about 58¾ million cubic feet; while for the second year it rose to 62 million feet. Therefore during even the first two years many alterations and extensions were carried out under Mr. North's management—these including the rebuilding of the whole of the retort-benches and the telescoping of both holders. During subsequent years the output has not invariably been in the upward direction; but on balance the growth of the business has proved highly satisfactory—the amount of gas sent out during the twelve months to March 31 last having been over 150 million cubic feet. From profits realized over the past seventeen years, the general district rate account has benefited to the extent of close upon £9000; while the cost of a large amount of extension work (including a carburetted water-gas plant) was met from the same source, the total sum involved reaching many thousands of pounds. On the opening of the works, the loan debt was £80,000; whereas on March 31 last the outstanding loans (less sinking fund invested in Consols) amounted to £50,000. The present average selling price of gas is 1s. 11½d. per 1000 cubic feet; and no meter-rents are charged. Gas for power is sold at 1s. 4d. per 1000 cubic feet, less 5 per cent. discount. The work at present in hand to cope with the growing demand is the erection by Messrs. C. & W. Walker of a 500,000 cubic feet spiral-guided holder in a steel tank; while the Committee have under consideration new condensing and scrubbing plant, the extension of the present retort-bench, and the laying of a 20-inch trunk main from the works to the centre of the town. Members were interested in seeing the excavation and foundation work for the new holder. Owing to difficulties in connection with the soil and the site, special precautions have had to be taken; it having been found necessary to go down to a depth of 19 feet, and fill in with concrete. The tank will have a diameter of 120 feet, and a depth of 28 feet; and the holder will consist of two lifts, with provision for a third. That Mr. Cooke is urgently in need of further storage is evident from the fact that the present gasholder capacity is 450,000 to 460,000 cubic feet, and often in the heavy season the daily output reaches 700,000 cubic feet.

There are seven beds of eight single retorts, 22 in. by 16 in., hand worked, and fired on the regenerative system. Five charges of 3¼ cwt. each are put in per 24 hours; the make per mouthpiece being 9400 cubic feet. The production of gas per ton of coal carbonized is 12,400 cubic feet. The President pointed with some justifiable pride to a new station meter and governor house, which was built by the stokers last summer, when it would otherwise have been impossible to find a job for them on the works. This house contains a 50,000 cubic feet per hour station-meter, two Parkinson governors (one 20-inch and the other 10-inch) with bye-passes, and the inlet and outlet gasholder valves. The old meter and governor house has been turned into the general office—and a very good general office it makes. In addition to what has already been referred to, other extensions include a Holmes washer of 1,000,000 cubic feet a day capacity, a cyanide washer, and new purifiers. The latter consist of four boxes, 25 ft. by 25 ft. by 5 ft., for oxide, and one box of the same size, but divided into two sections, for lime. Also 3000 slot-meters have been fixed, with fittings and stoves complete; and many mains have been duplicated in various parts of the district.

The carburetted water-gas plant, which is put into operation in the winter time, is by the Economical Gas Apparatus Construction Company, and is capable of generating 340,000 cubic feet per day. The engines, blowers, and exhausters are all in duplicate; and as each set has been designed to deal with a daily output of 600,000 cubic feet, all that will be needed to reach this make will be another generator and superheater. The apparatus has been erected in the old No. 2 retort-house. The water gas has a complete plant to itself; it being finally measured by its own station-meter, of a capacity of 30,000 cubic feet per hour. Mixture with the coal gas then takes place at the inlet-valve of the holder. In connection with this section of the works, there is an oil-tank of a capacity of 150 tons.

A Luncheon.

After the inspection, the party of nearly one hundred repaired to the Talbot Hotel and partook of luncheon, on the invitation of the Chairman of the Gas Committee and the Right Hon. J. W. Wilson, M.P.—Mr. Thomlinson being in the chair. A short toast list followed.

The Chairman, in a few appropriate words, having proposed the Loyal Toast,

Mr C. Meiklejohn submitted "The Town and Trade of Oldbury." The trades of the town were, he said, so numerous that in his time one could scarcely think of an industry that was not to be found there. He was delighted to know that the Gas Department was in such a flourishing condition.

Councillor Parkes, who replied, said the town was growing; and he went on to point out that they were not very much troubled with strikes. The employers paid good wages; and they also obtained good dividends for themselves.

The Right Hon. J. W. Wilson, M.P., in proposing "Success to the Midland Association of Gas Engineers and Managers," expressed his pleasure at being able to join in welcoming the members. He remarked that Mr. Thomlinson and himself had both served on the local governing body of the town for over a quarter-of-a-century, so that they could fairly claim to have done their best for the place; and this, he took it, was just what the members of the Association were doing in the places in which they were engaged. Those connected with the gas industry were in a somewhat unusual position, inasmuch as they were not in competition one with another, and so were able to freely compare notes. In fact, the more they compared notes with each other, the better were they serving both the industry and themselves. In this respect, of course, they differed from most manufacturing industries; and such gatherings as the present one must be of much help to the members. Mr. Cooke had been at the gas-works since they started; and, though modest in bearing and not pushing, he was always on the spot in an emergency. He could give no higher testimony to Mr. Cooke's work than to say he was able positively to rejoice, from the point of view of the gas undertaking, in the recent coal strike. He sold more coke and more gas for manufacturing purposes than in any similar period before, and kept all the public lights fully going. Really, taking the gas undertakings over the country as a whole, they reflected great credit on their managers in being able to face as they did the stress that came from the unfortunate coal strike.

Mr. Cooke, in responding, said this was a "red-letter day" for him. He was delighted to see so many members of the gas fraternity in Oldbury. As to the remarks made by the proposer, he could only say that from Mr. Wilson and the present Chairman of the Gas Committee he had received the greatest help during the past twenty years. They had always been pleased to do anything for the Gas Department.

The toast of "Kindred Associations" was submitted by Mr. Thomas Berridge, and responded to by Mr. Samuel Glover, who said the gas industry was striving to fulfil the duty of supplying light, heat, and power to the community at the cheapest possible rate and with the greatest facilities. They had banished for many years now the feeling that was likely to come to a man if he was in possession of a monopoly. Gas people were convinced that they could supply this light, heat, and power on better conditions than anyone else—even favoured municipal electrical concerns.

Mr. J. F. Bell proposed "The Chairman and Members of the Gas Committee," and voiced the obligation the Association were under for the privilege of inspecting the gas-works and for the pleasant time they were spending in Oldbury. It was 32 years since the works were opened; and in the interval immense progress had been made. The capital had been reduced to £300 per million cubic feet of gas sold; and there were very few towns of the size of Oldbury that could boast of selling gas at 1s. 11½d. per 1000 cubic feet for lighting, and something over 1s. 3d. for power purposes. For the past twenty years they had not charged anything to capital account; and, in addition to this, they had handed over about £9000 to the rates within the last seventeen years, and spent a large sum on extensions out of revenue—which explained why they were able to sell gas at so low a price. Much of the credit for the success of the undertaking must be given to Mr. Wilson. Mr. Thomlinson and Mr. Cooke had both told him how much the ratepayers of Oldbury owed Mr. Wilson for what he did during the 23 years he was Chairman of the Gas Committee. The works were well ordered and well regulated, and were keeping abreast of the times.

The Chairman briefly acknowledged the toast; and those present then drank the health of Mr. Charles Heaton, one of the Managing-Directors of the Brades Steel-Works.

The Afternoon's Proceedings.

On rising from the tables, the visitors found brakes waiting to convey them to the steel works of Messrs. William Hunt and Sons—The Brades, Limited. This was a visit which was much appreciated by those privileged to take part in it, as it was stated that, though the works have been established for some 120 years, this was the first occasion on which they had ever been thrown open for inspection. The time at disposal was, of course, much too short to permit of anything like an adequate examination of the various processes in operation; but very much of interest was seen. The portion of the works visited are devoted to the turning out of all kinds of edged tools, spades, shovels, and forks, and similar articles. From one department alone there is a weekly turn-out of from 1000 to 1500 dozen spades, forks, and shovels, which go all over the world. There are three rolling-mills (the first engine in one of which was put down by Watt himself); and the firm roll all their own sheets. The great point about the shovels, it was explained, is that each plate is rolled separately, by which means it is possible to get the middle of the plate about half as thick again as the two sides. Cheaper kinds can, of course, be had cut out of sheets. Special attention was drawn to the coke forks, the prongs of which, again, are rolled. The patterns of spades and forks are bewildering in their variety; but it has to be remembered that different spades are required for almost every county, according to the soil, &c. For instance, trouble would assuredly arise from sending a Dorset spade into Wiltshire. Special departments are devoted to picks and axe-heads, for which the firm enjoy a world-wide reputation. Attention was paid to the power hammers and the stamping and forging processes; and a little time was also spent watching the men at work in the three grinding mills. The visitors were further able to witness the manufacture of a new patent spade, for which the firm hold the English rights. The main feature of this implement is that it is a stamped steel spade all in one piece, with a closed socket, which gives it great strength.

The brakes having been once more requisitioned, the drive was continued through Smethwick to the Birmingham suburb of Edgbaston. There, in the beautiful Botanical Gardens, the members were the guests of the President and Mrs. Cooke at afternoon tea—a delightful little open air function which formed a fitting conclusion to a thoroughly successful day, and for which Mr. and Mrs. Cooke were duly thanked, on the proposition of Mr. W. Langford, seconded by Mr. Bell.

A repeat order for Dessau vertical retorts has been received from Chemnitz—for ten beds of eighteen 5-metre retorts, or 180 retorts in all.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Quarterly Meeting in Perth.

The Second Quarterly Meeting for the present session of the Eastern District Section of the Scottish Junior Gas Association was held in the Lecture Room of the Museum, Perth, on the 25th ult.—the PRESIDENT (Mr. John R. Moyes, of Edinburgh) in the chair. The attendance was not large.

VISIT TO THE GAS-WORKS.

Prior to the meeting, the members, on the invitation of Mr. D. Vass, the Gas Engineer and Manager to the Perth Corporation, visited the gas-works, which are situated on the south bank of the Tay, overlooking a lovely stretch of country. Although but recently transferred from Airdrie to Perth, Mr. Vass is already well under-way with the important improvements which are being carried out at the works. The members were much interested in the installation of De Brouwer charging and drawing machinery, as well as in the electric hoist for the coke-screening plant and the electric capstans.

On assembling in the hall,

The PRESIDENT, in opening the proceedings, said it was disappointing that the members did not attend in greater numbers. It was not a suitable time for a large meeting, as there were always a number of removals which made extra work at the gas-works. They had with them that afternoon Mr. Vass, one of their latest honorary members; and he (the President) had much pleasure in calling upon him to give them an address. He need hardly introduce Mr. Vass, as he was well known in the profession; and he only wished the members to give him a hearty reception as one of their latest recruits.

ADDRESS BY MR. VASS.

Mr. VASS, who was cordially received, said the President had rather taken him aback, as he had not intended to speak. The original idea was that Mr. M'Lusky was to deliver an address; and when the question was put to him (Mr. Vass), he pointed out that the difficulties attending a removal to a new sphere were such that he could not see his way to give what they termed an address. But their worthy Secretary would not take this denial; and the next he heard was that his name was on the programme. The best he could do was to offer a few rambling remarks on his past experience.

One of his earliest difficulties as a manager was in connection with an extensive alteration at the gas-works at Portobello. With the view of economy—and this had always been a great aim with him as a young manager—he had planted a great many connections, taken them out, and put them in again; and he found that his experience was that it was not true economy in the long run, because when they came to work in special castings by one foundry to castings they had from another, they had tight joints and other troubles which very nearly landed them in the dark. They had a great struggle to get the connections to work in well, with the result that by ten o'clock at night he was sitting on the gasholder to see if it was going up or down. [Laughter.] They were within a few inches of touching the ground. They got over some of the difficulties by using cement grout, which they ran in instead of lead. These were only meant to be temporary joints; but he believed that until the time the Portobello works were demolished the joints held good, and would be still holding good unless the gas-works were wiped off the face of the earth.

Another little difficulty with connections occurred not so far back in his experience; and this was in taking out quite recently an old disused governor at Airdrie. The particular governor had one of the four-way valves—a feather valve—which gave a turn every quarter of a circle which altered the gas-course. They had bladders in the pipe to stop the supply of gas while they were taking away the governor, because the four-way valve would not move. It stuck fast to the ground. They had 10-inch plugs standing by; and as soon as they broke the connection there was such a flow of gas that he did not think the bladder was right. They tried to drive in the plug; but it would only touch the face of the hole and then jump off. They struggled away, one man after another taking turns trying to get the plug in. They had to stand back until they procured new bladders. Had there been any light near, the consequence might have been serious; but it was broad daylight. They got new bladders and had the thing cleaned. The form of valve would not admit of the plug going in.

Another of his difficulties was in connection with the purifiers at Portobello, where they had three with 18-inch lutes and one with 12-inch. This was because the smaller was an older purifier; and very frequently it blew at the lute when it had the full pressure on. They overcame the difficulty by filling the lute with clay, and making a seal very much as they did now with the rubber joint. In this way they frequently overcame their difficulty until they had new lutes made. They took off the old 12-inch lute, and bolted on an 18-inch one. The arrangement then was that the inside of the lute was 6 inches lower than the outside; but this did not interfere with the proper working of the lute, because after they had it filled up with 12 inches of water, and put on the cover, the pressure depressed the inside, and they had ample seal with 12 inches inside and 18 inches outside.

The same purifier was the cause of him making a slight alteration in the system of working. When he went to Portobello, he had as assistant-manager a man who also had to survey the meters; and the manager was expected to do the surveying of one-half of the town. They had a hot experience on one occasion by both having been detained out until the arrival of darkness. On the way back to the works, people were lighting up; and the nearer they came to the works the less light they saw. This was owing to the man who was left in charge turning on the purifiers without blowing off the air. This got into the holder, which happened to be full, and it went on to the town. They consequently had to change the arrangements; and another man had to go out instead of the manager.

About the same time, they had another accident. It arose one Saturday afternoon just at closing time—two o'clock. Owing to the small lute, a workman opened the valves to release the purifier for the time being. He opened one valve halfway instead of fully, and on turning on the gas for a minute or two he ran it through one box only into the town. When he managed to get the faulty box shut off, he went back to the valve, and instead of closing it down and reverting it to the working of the other three boxes, he, in the hurry, opened it out full. This was not discovered until several hours afterwards; and in the interval they had their hands full with another trouble. The same evening, one of the gasholders tilted, owing to a severe gale; and in doing so it knocked away several of the top guide-wheels, and was lying quite clear of them. This was a matter quite serious enough, because they had to depend upon this holder for the town's supply that night. The only way in which they kept the town going was by mounting to the top of the holder and getting a rope upon the column on the windward side, pulling the holder plumb against the gale of wind, and letting it down little by little. They were kept at it from four o'clock in the afternoon until eleven at night—feeding the town through the faulty holder. It was not until some hours after eleven that they found a mistake had been made in connection with the purifiers; and then they had some trouble in getting it remedied.

There was another purifier trouble at Airdrie. On one occasion, through a fault in connection with the chemicals used for testing the purifying material, they had run all their purifiers until they were foul. Acetate of lead salt purchased at the chemist's was an acid salt, and when used for a test did not readily show sulphuretted hydrogen. Their means of overcoming the difficulty was by putting in an alkali. This had been omitted, with the result that the men were reporting periodically that the purifiers were clean, although they found out afterwards that they were quite different. After this they made arrangements that when a holder had foul gas in it to run back the gas through the exhauster, instead of putting the holder on the town. In this way they had a preventive of the possibility of foul gas getting out to any great extent, if they only caught the trouble in time.

There was another recollection which was brought to his mind by the coal strike. It was in connection with the trouble of the railway strike some years ago. Being near a coal mine —Niddrie and Benhar—they thought that they were very safe, because they could cart in their coals day by day. But as the days passed and no end of the coal strike came, they found that the horses that were available for their service were not keeping pace with the requirements of the gas-works. Their stock was gradually reduced until he often looked at the papers so as to see whether Edinburgh or Portobello would be in darkness first. They were within six hours of stopping their supply, when they received from one of the collieries a special consignment of coal brought on by the colliery railway engine-driver. On the following day the strike collapsed. During this time he was loth to use some of the material that came in. One of the colliery firms in Glasgow wrote to him stating that they had several tons of material beside them—samples from all parts of the world—which they wished removed owing to some alteration in the office. At the gas-works they were glad to have anything; but it was a matter of regret to him to see the splendid geological specimens from Australia, America, and all parts of the world, going in as common coal. It was a case of being content with whatever they could get; and even though it had been gold instead of coal, it would have had to go in the same way. [Laughter.] It was much better than some of the material that was sent in to some of the gas-works during the recent coal strike.

The PRESIDENT thanked Mr. Vass for his address, which, he said, was another example of the fact that a gas manager's position was not always a bed of roses. With regard to the business of the meeting, he regretted that Mr. Scott, who was to have read a paper on "Carbonization in Bulk," was not able to be present, as he had been appointed Head Chemist at Salford. He called upon the Hon. Secretary (Mr. W. Geddes, of Granton) to read the paper Mr. Scott had prepared.

The HON. SECRETARY then read the paper, as follows:

CARBONIZATION OF COAL IN BULK.

The tendency nowadays in modern gas-works practice seems to be towards larger charges; and, of course, these require longer periods to burn off. We are able now, with the modern stoking machinery, to practically fill our horizontal retorts. Many gas managers have found it advantageous to do so, and claim better

results. The vertical retort also is, of course, practically filled; and here again there is the same tendency to increase the size of retort and charge. It is not my purpose to discuss the advantages or otherwise of large charges in ordinary retorts, but to try to give an outline of the carbonization of coal in large chambers or ovens, as carried out in the production of coke for metallurgical purposes.

The modern bye-product recovery coke-oven, though primarily developed and designed for the production of coke, can be, and is, utilized for the production of gas; and many towns in Germany and America are being now solely supplied with coke-oven gas. There are some few districts in England where this gas is supplied to the public for lighting, &c., either through gas-works or through their own mains. The utilization of coke-oven gas has not made very much progress in this country, probably owing to the uncertainty of the supply, which was brought to our notice very prominently during the recent coal strike. I know of one district not far from Manchester where they were compelled to go back to ordinary gas-retorts, and by this means kept up the supply.

The modern regenerator coke-oven has a surplus of something like 50 per cent. of the gas made. By this I mean that, supposing a coke-oven proprietor is carbonizing a coal yielding 10,000 cubic feet of gas per ton, 5000 cubic feet are used to heat the ovens, and the remaining 5000 cubic feet are available for other purposes. What is he to do with this surplus? He, of course, wishes to dispose of it to the best advantage, and, since it is a bye-product, he is willing to sell at a cheap rate.

There are three ways open to him, all of which are utilized: (1) He can burn it under his boilers to produce steam—*i.e.*, if he needs power outside the coke-oven plant. This is a very crude way, and the value per 1000 cubic feet, compared with slack on a calorific basis, is only about 1½d. (2) He can purify the gas and use it in gas-engines for the production of electric power, which is then distributed. This has been done largely in the North of England, where an Electric Supply Syndicate are now utilizing the waste heat from many manufacturing processes. (3) He can undertake the purification of the gas, and its distribution for heating and lighting, &c. It is already partly purified, as he recovers the ammonia and tar and also benzol. He has to remove the sulphuretted hydrogen only, and then it is ready for distribution.

In Germany, coke-oven gas is becoming a serious competitor with ordinary coal gas; and it is being distributed through high-pressure mains to towns and villages some considerable distance from the works. The gas produced by the coke-oven is equally as good as that made in the ordinary gas-retort. Further, the coke-oven can be arranged to supply a richer gas, as I will explain later. Many of the advantages claimed for the vertical retort also apply to the coke-oven. Among others, there are: Better coke, better tar and more ammonia, also less trouble with sulphur compounds, and the labour cost is less. With respect to the coke, I may say that the coke-oven variety is very hard and dense, would not burn freely, and could not be used for domestic purposes. At the same time, it is possible to produce in the coke-oven a domestic coke; and this is often done in America, where there is a large demand for it for use in stoves.

I think I have shown that the coke-oven deserves our serious consideration. I will now proceed to give a description of a modern coke-oven and a short account of its working. There are two distinct types of bye-product recovery ovens—viz., the waste-heat type and the regenerator type. In the former, the gases, after combustion in the flues of the oven, pass to a large main flue at a high temperature (about 1800° Fahr.), and thence under boilers to the chimney. The air for combustion is cold, or only slightly warmed, by contact with the walls of the passages under the ovens. In the regenerator type of oven, the gases after combustion in the heating flues of the oven, pass to a regenerator of the Siemens type. This becomes heated by the hot waste gases, and is, in turn, used to preheat the air for combustion. In the waste-heat type of oven, we have a surplus of about 15 per cent. of the gas, and this is increased to 50 per cent. in the regenerator type.

It is to the regenerator type of oven that I wish to draw your attention, as this type has been recently adopted for gas-making purposes. The essential difference between it and the modified form of oven for gas making is that in the coke-oven the gas is not preheated but only the air; while in the gas-making oven both gas and air are preheated, and instead of using a part of the coal gas producer gas is used for heating.

There are a great many different ovens in use, and as regards the general shape of the oven they are similar. There are, of course, great differences in the heating arrangements. I had some experience with the Koppers regenerator type of oven during the time that I was with the Manvers Main Collieries; and I will briefly describe the ovens in use there. The plant consists of a battery of 36 ovens with recovery plant. Each oven will hold about 7 tons of coal; and the period of carbonization with wet Yorkshire slack is about 29 hours. The ovens are rectangular chambers, 10 metres (about 33 feet) in length, 20½ to 22 inches in width (the taper facilitates the pushing out of the charge), and about 6 ft. 6 in. high. The coal, which is first finely crushed, can be charged into the oven from the top through three openings fitted with lids. If washed slack is used, it is generally compressed into a cake by a charging-machine, and introduced by the end door of the oven. The machine is a rectangular box, slightly smaller than the oven. The bottom consists of a strong steel sole-plate, and one side of the box is movable. The crushed coal is let into this box from hoppers, and is compressed by a travelling stamping arrangement. The coal is admitted in small quantities at a time, and stamped into a solid cake. The side is then moved away, and the cake of coal pushed into the oven on the sole-plate; and the door is then lowered and fixed, and the sole-plate withdrawn. The oven door is then lowered completely and sealed with clay. The average amount of water in the cake is about 12 per cent., and it keeps together quite well with this amount. If too dry, it would break. By compressing in this way a hard and more uniform coke is produced. The charge is extracted by pushing it out on to a coke bench by means of a ram; and it is slaked by passing through a hood from which jets of water play.

The gas from the oven passes, by means of the ascension-pipe, into a large main running on the top of the ovens the entire length of the battery. A dry main is used instead of the hydraulic main usual in gas-works, and a separate valve is fixed to each ascension-pipe. Tar is usually circulated through this main, and it prevents any deposit of pitch forming. From the main the gas passes through the condensers, exhauster, tar-extractor, scrubbers, and back to the ovens to be burnt. By providing two mains, a better gas for lighting purposes can be obtained by taking the gas into the lighting main only for a portion of the period of carbonization. This has been done, I believe; but it means a separate plant, and seeing that it is possible to produce gas of more than 600 B.Th.U. gross calorific value by the ordinary method, it is not necessary.

[The author then, by means of diagrams, described one of the ordinary type of Koppers' regenerator ovens.]

One of the diagrams showed longitudinal and cross sections through the ordinary type of Koppers regenerator oven. The type of oven described has two regenerators running the whole length of the battery. They are used alternately—the one heating the air for combustion, and the other receiving the hot products of combustion from the flues of the ovens. They are changed by a simple arrangement of dampers, worked automatically every half hour. In the most recent form, each oven has a separate regenerator, and in the event of anything going wrong with it it only affects one oven; whereas if repairs are necessary to the regenerator in the ordinary type, it means shutting-down the whole battery.

With regard to the use of the Koppers system of ovens for gas making, I am informed that they have at present under construction, or in operation, no less than thirteen installations of chamber ovens with a daily make of upwards of 47 million cubic feet of gas. I note that the Birmingham Corporation are now putting in an installation of Koppers chambers, the results from which will be watched with interest.

An account of one of the earlier installations of Koppers ovens at Innsbruck, appeared in the "JOURNAL OF GAS LIGHTING" for April 26, 1910. I extract therefrom the following figures, which I think compare remarkably well with other systems of carbonization. The plant consists of six beds of horizontal chambers (three to each bed)—four being in operation.

Size of chamber: Length, 16 ft. 5 in.; height to which filled, 8 ft. 2½ in.; capacity, 74 cwt. 90 lbs. per chamber.

Time required for carbonizing, 24 hours.

Results: 11,788 cubic feet of gas per ton of coal (Saar), of 633 B.Th.U. gross calorific value per cubic foot. Calorific value varies only from 16 to 22 B.Th.U. per cubic foot. Consumption of coke (ash free and dried) 12 per cent. by weight of the coal carbonized.

Discussion.

Mr. W. MITCHELL (Dundee) said he should like to ask a question as to the life of the retort. The author said that some of the gas engineers in Germany were getting afraid of this kind of working. He did not think the engineers in Scotland need be in any fear of the plant doing any harm. Let them take, for instance, Fife coal. If this were ground up and made into a cake, would it be suitable for the production of coke? He did not think it would. They wanted a finer coke. Fife coal would never be a coking coal they could use.

Mr. J. BELL (Kirkintilloch) said he had been very much interested in the coke-producing practice, because he came from the Kilsyth district, and there they would see charges often producing coke on the same lines as those referred to in the paper; and, in his opinion, it was a practice that could quite easily be adopted in gas-works. They could produce coke that would be of great value to gas managers. Now that they were in the days when gas of lower illuminating quality was preferable to that having high light-giving power, he did not see why the coke-oven practice could not be adopted in ordinary gas-works. In Kilsyth, the work appeared to him to be very simple. The operations were carried out once in 24 hours; the charges being of 24 hours' duration. He was told that a large yield of sulphate of ammonia was obtained by the process, though he had no figures. The amount of money made out of the process by the other products was a great deal more than that made out of the ordinary gas-works products.

Mr. WILSON (Perth) asked what the surplus gas was used for.

Mr. BELL said it was employed for steam-raising purposes.

Mr. S. M. N. BUTLER (Perth) thought the same percentage of foundry fuel would be used for producing the larger quantity of coke.

Mr. T. W. HARPER (Dundee) agreed with what Mr. Bell had

said about the utility of coke-ovens being introduced into gas-works. Ultimately gas making would, he said, come down to the coke-oven products, or a practice that would give a coke of such quality that it would be saleable for all purposes, such as foundry and domestic work. The difficulty was getting a coke for foundry work locally. They could not get it in Dundee or in Glasgow. He learned that by the process there was a greater yield of sulphate of ammonia and a better class of tar; and he did not see why it should not be introduced into gas-works.

Mr. R. B. CHALMERS (Alva) said he tried double charges in horizontal retorts, and gave it three times as long in the retort as he did before; and the coke they were producing was of no use at all. They were not using big coal; it was shingles and pearls. So there was really no benefit. He could not say whether there was any more tar or sulphate of ammonia.

Mr. BELL said he increased the duration and the weight of the charge—the latter by about ½ cwt. (to 2¾ cwt.), and the duration to 4 hrs. 8 min.—and he got an additional 1000 cubic feet of gas per ton. Last year's returns showed an increased yield of 970 cubic feet, using the same class of coal.

Mr. J. J. SCOTT (Kennoway) said he also tried the heavy charging, using the same coal, and he was touching 10,000 cubic feet, compared with 8700 cubic feet last year. He was inclined to think Fife coal would not be very suitable.

Mr. VASS said there was one point he should like to put to Mr. Scott. There was in his paper a remark that by the process they recovered ammonia, tar, and benzol. Did not the benzol recovered affect the heating power of the gas to any considerable extent? With the figures the author gave, he (Mr. Vass) would be a little surprised if he obtained the heating value after working out the benzol. Nowadays luminosity, he might take it, was dead. It was now entirely a case of heat value. He was rather afraid Mr. Scott might, in his paper, have been dealing with two different things—in one case with gas from which all the luminosity was taken out and the bye-product gas used for heating boilers; and in the other with gas to be used always for its heating value for domestic purposes. He agreed with the other speakers that in the matter of the coke-oven they must use a special coal. Even some of the coals that were closely allied to the coke district did not do so well as others, though closely associated geographically. This was a point which narrowed-down the idea of operating coke-ovens in gas-works. Not every gas-works could secure the material to work them. They were coming near it in many of their works by means of chamber retorts and horizontal retorts filled with heavy charges. They were getting a coke which nearly resembled foundry coke. There was the question as to the bulk of material; but this might be overcome in fairly large chamber retorts.

The PRESIDENT said he did not think the gas manager in Scotland was likely to suffer as much from the competitive point of view as the one in the Midlands, because there was not so much coke made in Scotland as in the Midland counties and the North of England. Then there was always difficulty in disposing of the surplus gas. Would the production of the coke pay better if the gas had to suffer by the extraction of benzol? Would it be better to leave the benzol and sell the gas, or extract the benzol and allow the gas to go as waste? He moved a vote of thanks to Mr. Scott for his paper.

The motion was carried with applause.

The HON. SECRETARY then read the following paper on

COAL RESERVES.

To my mind, the subject which is down for discussion to-day is a very pertinent one. At present, we in the gas profession are beginning to recover our equilibrium from a period of stress which fortunately has been a rare phenomenon in our industry. But those of us who have followed the trend of events in the industrial world during the past few years know that such eruptions will not be so rare in the immediate future. All the portents point to a deadly struggle between Capital and Labour. There is a seething mass of discontent among the workers of all industries—the danger of outbreak being in direct ratio to the organization which has been brought into operation. Thus we find that the miners, who are perhaps among the best organized bodies of workers, were able to partially paralyze the commerce of the country for some five weeks—from the 1st of March to the 8th of April—though at great loss to themselves and their own class; and, after all, they were defeated. It is quite true they were successful in obtaining the principle of the minimum wage; but the possession of the "principle" without the money is having the bone without the meat.

I should just like to say here that I am no believer in the strike, even the general strike, as a lever for improving the lot of the worker. It is like two forces waging war—the invaders armed with bows and arrows and the defenders with machine guns. To such an unequal contest there can, of course, be but one ending—the ignominious defeat of the bow-and-arrow army. No. The worker has another weapon lying ready at his hand; and when he learns to use it to his own advantage, strikes will be regarded as being as inhuman as the dum-dum bullet. I should like very much to elaborate these points; but this is neither the time nor the place for doing so. The point, however, which I do wish to emphasize is that the gas industry must be prepared, and that at once, for another strike more severe, through the sympathetic striking of other workers, though probably of shorter duration, than that which we have just encountered.

In this connection, it may be useful to quote a sentence or two from an article by Mr. Vernon Hartshorn, the stormy petrel of South Wales. Writing in the "Daily Herald" for the 18th of May, Mr. Hartshorn said:

> It may be taken for granted that the Miners' Federation will not tolerate the wretched minimum rate fixed for the labourers in South Wales. Some action must be taken. If that action is on strike lines, it must be taken with a view to the general position. The state of things in the labour world at present renders it imperative that common action upon a scientific basis shall be taken if we are not to court confusion and disaster.

If this labour leader be a true prophet—and I think he is—then the sooner we prepare ourselves to weather the coming storm the better.

On the presumption, then, that we shall have another strike ere long, we have to ask ourselves: "How much coal must we have in reserve, allowing an ample margin for safety?" To this query I should reply: "Sufficient to last from the beginning of December to the middle of January, though the timid manager may sleep sounder o' nights if he knows that he has three months' supply in hand." I am strongly of opinion, however, that another strike in the immediate future would not last a month, and that for the following two very powerful reasons: The solidarity of the miners would be broken before the expiration of four weeks owing to the present depleted state of their funds and consequent starvation; and the public would force the Government of the day to abolish the so-called "freedom of contract."

There are many interesting points which can be dealt with in this discussion. I need only mention a few: The relative advantages and disadvantages of outside and inside storage; the choosing of suitable coals for reserve purposes; and the decreased yield, but enhanced value, of bye-products.

Discussion.

Mr. BELL said he happened to be one of those fortunate gas managers who weathered the storm without having recourse to another market during the strike. Prior to it he found great difficulty in getting a stock of coal put in. In going over his contracts, he found some of them were very far behind. Before the strike he was prepared with approximately 8000 tons in stock; but at the end he had only about 120 tons. He should say gas managers ought to have a large stock of coal.

Mr. CHALMERS thought he was one of the unfortunates. They did not get in the quantities of coal they should have had; but immediately after the strike finished the contract supplies came in again. The strike clauses in contracts specified that during strikes deliveries might be cancelled; and in some works the month's supply was never made up. Their strike clause said their deliveries were to be suspended, and they were to get the full quantity by the 15th of May. But they did not manage it; so they were still waiting for last year's contract coal, and would do so until the end of June. They found that during the strike they obtained as much advantage by buying small as large quantities of coal. He thought the strike clause should read that supplies would be suspended, not cancelled. They were laying in a large stock.

Mr. VASS: What period does 1000 tons represent?

Mr. CHALMERS: The third of a year.

Mr. SCOTT said the wording of their strike clause prohibited them getting their supplies. The coal agents said the quantity due to complete the contract was coal to the amount that could have been delivered during the period of strike; and therefore the clause was cancelled. He thought it would be advisable to have the contract form amended.

Mr. VASS said an endeavour was made by some of the contractors to read the strike clause in the way indicated. He took exception to it, because the clause only embodied stoppage of material during a strike, and did not cover the cancelling of proportions during the period. It would therefore be advisable for everyone to have a strike clause clearly stated. He would be in favour of having at least six weeks' supply of coal in stock. In the works which were closely associated with the coalfields, and even where they were farther away, they could not increase the quantity proportionately because of the difficulty of transit. With regard to storing coals, the speaker gave instances in which he had large bings in the open, and, as far as he could see, while the coal had deteriorated, it had not done so to such an alarming extent as to prevent him doing the same thing again, if ever necessity arose, with fairly soft coal.

Mr. A. R. WILSON (Perth) said they had some coal under cover for two years, and it went into the retorts like flour and came out in the same condition. This showed that storing coal under cover did not improve it.

The PRESIDENT remarked that the coal strike was not altogether unfavourable to gas managers, as it had made a large number of people use more gas for domestic purposes. With regard to storage, the coal must deteriorate to a certain extent in the bing. The question for them all was how long it should be allowed to remain there.

A cordial vote of thanks was passed to the President; and the proceedings terminated.

EXTRACTION OF AMMONIA FROM COAL GAS.

The "Zeitschift für angewandte Chemie" for April 12 contained an article by Herr WALTHER FELD on the extraction of ammonia, with or without sulphuretted hydrogen, from coal gas, by means of sulphurous acid, with production of ammonium sulphate and free sulphur. The following translation is a summary of the article.

The great increase in the production of ammonia in the coal-gas industry and the growing demand for sulphate of ammonia for agricultural purposes bring into prominence again the old attempts to combine the ammonia with sulphurous acid instead of with sulphuric acid. The heavy cost of the sulphuric acid plants makes the price of the finished article very high in proportion to the cost of the raw materials. Moreover, sulphuretted hydrogen must be removed from the coal gas before the latter leaves the gas-works. Hence it would seem at first sight to be an easy matter to turn the somewhat expensive process of purification into a source of gain to the gas-works by combining the sulphur, in the form of sulphurous acid, directly with the ammonia; and this would have the further effect of rendering the gas industry independent of the sulphuric acid works—an independence which for many reasons would be very welcome.

The difficulty is to effect the combination of ammonia with sulphurous acid in practice. The fact always has been, and still is, overlooked, that the physical and chemical natures of both substances render a complete mutual combination impossible. The normal ammonium sulphite $(NH_4)_2SO_3H_2O$, which has a strong alkaline reaction, gives off ammonia to the air, in aqueous solution as well as in crystal form, and in quantities which increase with increasing temperatures. The result is the formation of a very unstable acid salt $(NH_4)_2\,SO_3SO_2$. This gives off sulphurous acid to the air, and only a small proportion is converted into the sulphate. This property of the sulphite makes it impossible to absorb completely the ammonia which is contained in gases, by means of sulphurous acid in aqueous solution or in other gases. If these difficulties can be overcome by the judicious choice of the proportion in which the ammonia and the sulphurous acid are mixed (which in practice does not seem possible), even then the result is a very unstable salt, which in its striving after equilibrium constantly loses either ammonia or sulphurous acid, and whose equilibrium is, as a matter of fact, upset by every little variation of temperature or moisture in the air.

It is extremely questionable whether, as is sometimes asserted, ammonium sulphite is preferable to the sulphate for fertilizing purposes. Although the neutral sulphite contains slightly more ammonia than the sulphate, yet the former contains water also; and to justify its use, it should first be dried. This drying, however, must invariably be accompanied by loss of ammonia, as already explained. It is, moreover, very doubtful whether a salt which gives off ammonia and contains free sulphurous acid is more advantageous than the neutral sulphate. Therefore the suggestion of absorbing the ammonia by means of sulphurous acid must be carried further, and an attempt made to convert the sulphite into a sulphate by treatment with air or some other oxydizing agent. In practice, however, it is found that oxydization during even long exposure of the sulphite to the air is very limited; a large proportion of the neutral sulphite being merely converted into acid sulphite owing to the loss of ammonia.

In the course of his experiments the author discovered (some twenty-three years ago) that certain tar oils have a strong affinity for sulphurous acid and sulphur. If pure sulphurous acid be brought into contact with heavy tar oil in a closed flask and shaken up, the acid is to a great extent absorbed, with accompanying evolution of heat and formation of a vacuum. If to the tar oil thus saturated with sulphurous acid pure sulphuretted hydrogen be now added, this is also absorbed with similar evolution of heat and formation of vacuum. The sulphurous acid and sulphuretted hydrogen now react on one another in such a way that sulphur and water are separated out, and the sulphur is redissolved in the hot oil. If the tar oil is thus treated alternately with sulphurous acid and sulphuretted hydrogen, sulphur is finally separated out in crystal form.

Considerable difficulties were experienced in the attempt to adapt this process to gases which contained very small quantities of sulphurous acid or sulphuretted hydrogen. In these circumstances, the action of the compounds on the tar oil was not sufficiently strong to enable it to retain them from the passing gas. This objection might have been overcome by the use of a sufficient number of oil-washers; but other difficulties presented themselves also. The sulphurous acid in the gas reacted with part of the unabsorbed sulphuretted hydrogen, and sulphur was deposited in the pipes. Still worse, the tar oils which were used contained large quantities of naphthalene, part of which was taken up by the passing gas, and deposited later when the gas was cooled. This naturally gave rise to serious stoppages.

In the course of the same researches, it was found that zinc thiosulphate is broken up in such a way by sulphuretted hydrogen that zinc sulphide and free sulphur are formed.

$$(1)\quad ZnS_2O_3 + 3H_2S = ZnS + 3H_2O + 5\,S.$$

In practice it was found possible, by means of a single washer with zinc thiosulphate solution, to absorb 80 to 90 per cent. of the sulphuretted hydrogen contained in coal gas. The zinc sulphide could then be regenerated with sulphurous acid, thus:

$$(2)\quad 2ZnS + 3SO_2 = 2ZnS_2O_3 + S.$$

The solution of the zinc sulphide in sulphurous acid proved difficult. This was, however, accomplished; and then another trouble arose. The regenerated zinc solution lost its affinity for sulphuretted hydrogen to such an extent that only 10 to 40 per cent. of the latter could now be absorbed, and the coal gas even took up sulphurous acid from the neutral alkali. This is explained by the fact that the regeneration to thiosulphate is only partial; the formation of polythionate being the chief reaction.

$$(3)\quad ZnS + 3SO_2 = ZnS_4O_6.$$

The explanation is this. A neutral solution of zinc thiosulphate or of the polythionate is acidified by the addition of sulphuretted hydrogen, and in both cases zinc sulphide and sulphur are precipitated. But in the case of the thiosulphate, the amount of free acid present remains low, and the precipitation continues so long as thiosulphate is present. With the polythionate, however, the quantity of free acid is brought quickly to a maximum, and the precipitation of zinc sulphide and zinc thereupon becomes proportionately less.

It is to be assumed, then, that only zinc sulphide and free acid remain in either case.

$$(4)\quad ZnS_2O_3 + H_2S = ZnS + H_2S_2O_3.$$
$$(5)\quad ZnS_4O_6 + H_2S = ZnS + H_2S_4O_6.$$

The unstable free acid of reaction (4) is easily split up by sulphuretted hydrogen:

$$(6)\quad H_2S_2O_3 + 2H_2S = 3H_2O + 4S,$$

and by frequent repetition of this latter reaction the free acid is removed altogether. With the polythionate, it is different. The free polythionic acid of (5) reacts very slowly, if at all, with sulphuretted hydrogen; the most noticeable reaction being:

$$(7)\quad H_2S_4O_6 = H_2SO_4 + SO_2 + 2S.$$

This is proved by the fact that a gas containing sulphuretted hydrogen, when passed through a neutral zinc polythionate solution, always takes up sulphurous acid. The sulphurous acid, as it becomes free, might be expected to act on the sulphuretted hydrogen thus:

$$(8)\quad 2H_2S + SO_2 = 2H_2O + 3S.$$

This reaction, however, takes place to a very limited extent; a large part of the sulphuretted hydrogen is not absorbed; and the gas takes up sulphurous acid. As a matter of fact, even when the action of the sulphuretted hydrogen is very small, a constantly increasing proportion of zinc sulphate is to be found in the solution, with an equivalent decrease of polythionate.

This latter fact led to the idea of applying this process to gases which contain ammonia as well as sulphuretted hydrogen. It was found to be highly satisfactory as regards the completeness of the ammonia washing, and at the same time just as much (in some cases even 50 per cent. more) sulphuretted hydrogen was washed out. As already mentioned, the dissolving of the zinc sulphide in sulphurous acid is an extremely slow process; and to avoid this, iron salts were tried instead of zinc. The iron sulphide proved readily soluble in sulphurous acid; but another serious difficulty was now encountered. Under certain conditions, necessary to the process, part of the iron sulphide was converted into bisulphide (FeS_2), which is insoluble in sulphurous acid and could, therefore, not be reused in the process.

The series of reactions is best shown by the following equations:—

$$(9)\quad FeS_2O_3 + 2NH_3 + H_2S = FeS + (NH_4)_2S_2O_3.$$
$$(10)\quad 2FeS + 3SO_2 = 2FeS_2O_3 + S.$$
$$(11)\quad FeS_2O_3 + (NH_4)_2S_2O_3 + 3SO_2 = FeS_3O_6 + (NH_4)_2S_4O_6.$$
$$(12)\quad FeS_3O_6 + (NH_4)_2S_4O_6 \text{ (solution heated)} = FeSO_4 + (NH_4)_2SO_4 + 2SO_2 + 3S.$$
$$(13)\quad FeSO_4 + 2(NH_4)_2SO_4 + 2NH_3 + H_2S = FeS + 3(NH_4)_2SO_4.$$

The process consists in washing with a solution of iron thiosulphate the gases which contain ammonia and sulphuretted hydrogen. The latter components are absorbed and iron sulphide is precipitated, which again becomes iron thiosulphate when treated with sulphurous acid. By thus working alternately with gas and sulphurous acid, the proportion of ammonia salts present so increases as to make it worth while working the alkaline solution up to ammonium sulphate. The thiosulphates are boiled and treated with sulphurous acid according to (11); the resulting polythionates being converted into sulphates by reaction (12). At the same time, part of the sulphurous acid becomes free, and crystalline sulphur is deposited. This is washed and converted into sulphurous acid. The alkaline sulphate is again treated with the gas, as shown in (13), and iron sulphide is precipitated.

This process has proved to be quite practicable on a large scale; and at one gas-works it is employed for a daily make of over 2 million cubic feet. It has the disadvantage that the thionates of the metals used are very liable to split-up into sulphates, sulphurous acid, and sulphur, especially at higher temperatures. If anything, this rather aids the absorption of the ammonia; but it hinders considerably the taking-up of the sulphuretted hydrogen. Coal gas produced for lighting purposes, however, can well be treated at a fairly low temperature; whereas gas from coke-ovens ought to be dealt with at about 158° Fahr. in

order to produce a sufficiently concentrated solution of ammonium sulphate, since this gas contains a larger proportion of water, due to the washing of the coal.

Further experiments were made with the thionates of sodium and ammonia; and ammonium thiosulphate was found particularly adaptable, in that it is easily converted into the polythionate by treatment with sulphurous acid—thus :

[15] (14) $2\,(NH_4)_2S_2O_3 + 3\,SO_2 = (NH_4)_2S_4O_6 + (NH_4)_2S_3O_6$.

The following three equations, which are the final reactions of other minor ones, show that ammonium polythionate provides a means of washing ammonia and sulphuretted hydrogen, either singly or both at once, out of gas :

[16] (15) $(NH_4)_2S_4O_6 + (NH_4)_2S = 2\,(NH_4)_2S_2O_3 + S$
[20] (16) $(NH_4)_2S_4O_6 + 3\,H_2S = (NH_4)_2S_2O_3 + 5\,S + 3\,H_2O$
[23] (17) $(NH_4)_2S_4O_6 + 2\,NH_3 + H_2O = (NH_4)_2SO_4 + (NH_4)_2\,S_2O_3 + S$.

In all three cases the resulting thiosulphate is reconverted to the polythionate according to (14). The solution finally becomes saturated with ammonia salts, and part of it can be drawn off and converted to polythionate by (15), and hence to the sulphate required—thus :

[24a] (18a) $(NH_4)_2S_4O_6$ (heated) $= (NH_4)_2SO_4 + SO_2 + 2S$
[24b] (18b) $3\,(NH_4)_2S_4O_6 = 3\,(NH_4)_2SO_4 + 3\,SO_2 + 6\,S$.

$$\frac{2\,(NH_4)_2S_2O_3 + 3\,SO_2 + S = 2\,(NH_4)_2\,S_4O_6}{(NH_4)_2S_4O_6 + 2\,(NH_4)_2S_2O_3 = 3\,(NH_4)_2SO_4 + 5\,S}$$

That is to say, as soon as the quantity of polythionate present has reached a certain maximum, the sulphurous acid set free by the formation of the sulphate suffices to convert the thiosulphate present by way of the polythionate into the sulphate.

This simple and practicable process is a solution of the old problem of how to effect a complete mutual combination of ammonia and sulphurous acid. Besides absorbing from the gas these two "impurities," it renders possible the manufacture of ammonium sulphate without the use of sulphuric acid, and at the same time yields sulphur in pure crystalline form.

The final reaction for the formation of the sulphate from sulphurous acid and ammonia is this :

[27] (19) $4NH_3 + 2H_2O + 3SO_2 = 2(NH_4)_2SO_4 + S$.

Comparing this with the well-known reaction for the formation of the sulphite from sulphurous acid and ammonia

[28] (19) $4NH_3 + 2H_2O + 2SO_2 = 2(NH_4)_2\,SO_3$

it is seen that the whole difference consists in a small but all important change in the molecular proportions of the component parts.

This process enables the whole sulphuric acid works to be replaced by the sulphurous acid furnace, and at the same time affords a solution of the elusive problem of the purification of gas from sulphuretted hydrogen by washing.

RECOVERY OF HYDROCYANIC ACID IN GAS.

A patent has been taken out for France by MM. Guignard and Watrigant for a process for the regeneration of the hydrocyanic acid in gas. This is at present effected by conveying the cyanated gas through a solution of soda or caustic potash; an alkaline cyanide being produced. Evaporation, at a low temperature and in a vacuum, of the cyanide solution gives solid cyanide. During this evaporation, a very large quantity of alkaline cyanide is destroyed, with formation of ammonia and alkaline formiate. This decomposition, which may be almost total if the temperature rises during evaporation, will be avoided if evaporation is suppressed. This result is attained by replacing the aqueous by an alcoholic solution of caustic alkali. The formation of alkaline cyanide takes place according to the formula—

CNH	+	KOH	=	CNK	+	H_2O
Hydrocyanic acid.		Potassium.		Potassium cyanide.		Water.

Thus it is seen that one molecule of water is produced for each molecule of cyanide formed.

Formation of water would continually modify the solubility of the cyanide in alcohol made more and more aqueous. To prevent this, it suffices to add occasionally an alkaline metal to the mixture, to decompose the water produced. The alkali thus formed is added to that already dissolved in the alcohol to absorb new quantities of hydrocyanic acid; and the action of regeneration always occurs in a solution free from water. The cyanide precipitates, and decomposition, previously alluded to, cannot take place because the cause does not exist.

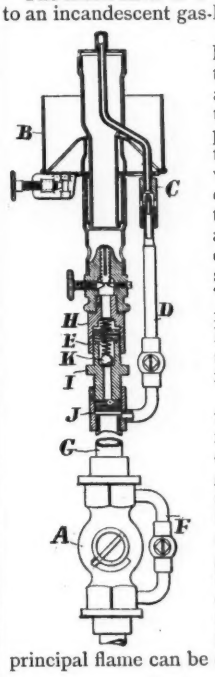
The following *modus operandi* is given by way of example: A saturated alcoholic solution of caustic alkali in an alcohol (methyl, ethyl) is prepared, and a certain amount of an alkaline metal added. The vessel containing the solution is cooled so that the liquid can never be heated by the reactions. The cyanated gas is conveyed into this solution. The hydrocyanic acid combines with the alkali, and forms alkaline cyanide and water. The alkaline metal in the mixture decomposes the water as it is produced, and replaces it by an equivalent quantity of caustic alkali. The cyanide formed (almost totally insoluble) precipitates. The decanted precipitate is treated to separate it from excess of alcohol; and the separated alcohol, mixed with more alkali and alkaline metal, is utilized in manufacture.

Instead of employing only one washer, it is preferable to wash the gases methodically by conveying them through a series of cooled washers containing the absorbing solution. Anhydrous alkaline oxides can be used for this solution instead of a hydrated alkali.

VALVES FOR INCANDESCENT GAS-BURNERS.

The specification has been published of a patent taken out for France, by the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, for a valve for incandescent gas-burners, with a pilot light and principal flame ignited and extinguished by the quantity of gas admitted; the passage to the burner being closed by a ball pressed against its seat by a spring. The improvement consists in the fact that the valve-box, mounted in the gas-pipe before the burner, forms a double joint, so that the pressure of the spring upon the ball-valve can be regulated by turning the box.

The illustration is a vertical section of the appliance adapted to an incandescent gas-lamp.



B is the burner head, and C the pilot light pipe, into the lower end of which the top of a rising gas-pipe D penetrates. In a position well within reach of the hand, there is a stopcock A mounted in the principal pipe, and a pipe F (also regulatable) running around the stopcock to convey gas to the principal pipe G when the cock A is shut. In the gas-pipe before the burner head there is a valve which has a joint H, and a valve-box I in the form of a double joint, screwed below, in a sleeve J, mounted on the gas-pipe as shown. The passage from the valve-box is enlarged near the top, from about the middle of its length, and the shoulder forms the valve-seat. There is on this seat a ball K, which is pressed downwards by a spring E.

By suitably turning the valve-box I, the tension of the spring E can be accurately regulated, so that the ball K can be raised on its seat by the ordinary pressure of the gas when the cock A is opened, and a sufficient quantity of gas can pass to reach the principal flame. When the cock A is shut, and the pipe F open, the pressure of gas is reduced so that it cannot lift the ball, and the valve remains shut; the gas only reaching the burner head through the pipe supplying the pilot light. Therefore by opening or closing the cock A, the principal flame can be either ignited or extinguished.

Centenary of the Gaslight and Coke Company.

From remarks which have been made from time to time recently in the "JOURNAL," readers will be aware that the present year is the Centenary of the Gaslight and Coke Company, who obtained their Charter of Incorporation in April, 1912, and subsequently inaugurated the supply of gas upon a commercial basis. It is the intention of the Directors, as intimated by the Governor (Mr. Corbet Woodall) at the last half-yearly meeting of the Company, to celebrate the centenary in a manner that will "impress it upon the memories of the employees;" and they have decided to invite the whole of those regularly engaged (other than the staff officers) who have had three years' service, and who can be spared from their duties, to a festival to be held at the Crystal Palace on Saturday, the 6th of July. The invitation is extended to the wives of the employees. The Directors point out that the occasion is unique; and they ask the hearty co-operation of everyone in endeavouring to make the day enjoyable and memorable. They purpose themselves celebrating this noteworthy anniversary in the Company's history by a dinner in the Imperial Banqueting Hall of the White City, on Wednesday, the 26th inst.

British Engineers' Association.—An organization to be known as "The British Engineers' Association" has been formed, with the object of promoting abroad, and especially in China, the interests of British manufacturing engineers. In September last, after several preliminary meetings and discussions, 22 of the leading British engineering firms decided to take the initiative in organizing the Association; and a Committee was formed to carry out the work until its incorporation. Meanwhile, a number of other firms signified their desire to identify themselves with the movement; and at the date of incorporation (April 26), the names of no less than 61 firms were on the list. The Association was incorporated under a licence from the Board of Trade, and is being carried on under the Companies Consolidation Act, 1908. Consequently, the liability of members is limited. The Secretary of the Association (*pro tem.*) is Mr. Stafford Ransome 38, Queen Anne's Chambers, Westminster.

REGISTER OF PATENTS.

Distillation of Ammoniacal Liquors.

WYLD, W., of Nechells, near Birmingham.

No. 25,716; Nov. 5, 1910—redated May 3, 1911.

This distillation is to be carried on at different pressures in several chambers—that is to say, an initial pressure sprays the liquid in the first chamber, after which the spraying of the liquid in the second chamber is effected by pressure within the first chamber caused by the spraying thereinto under the initial pressure—the pressure being maintained or controlled in the first chamber by a valve provided at the gas outlet. For the treatment of the fixed ammonia salts, the liquid may pass through an intermediate vessel containing a reagent without releasing the pressure. Any number of spray chambers may be combined on this system; the spraying in each successive chamber being effected by the pressure within the preceding chamber.

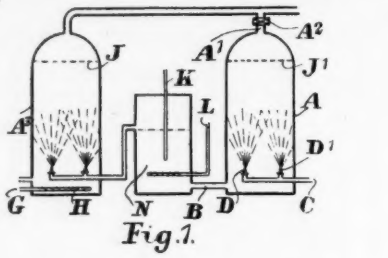


Fig. 1.

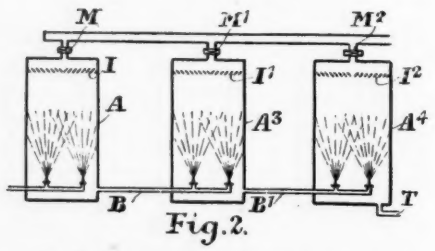


Fig. 2.

Wyld's Ammoniacal Distillation Apparatus.

Fig. 1 illustrates the invention with two chambers employed; also the intermediate vessel which may be used for the treatment of fixed ammonia salts. Fig. 2 illustrates the invention applied to three chambers, and from which its application to any number of chambers will be understood.

A designates one of the chambers or vertical columns (preferably round in cross section) in which the liquid is sprayed. A^1 is the gas outlet; and B the liquor discharge. At a convenient distance above the bottom, a pipe C is inserted, into which one or more centrifugal spray nozzles D D^1 are fixed upright, so that the liquor discharges vertically. The pipe C (and its nozzles) is arranged for easy withdrawal from the chamber when necessary to clean the nozzles. Through this pipe C the ammoniacal liquor, previously heated, enters. A steam supply pipe G (with or without a perforated projection H) dipping into the contents of the vessels may be used to assist distillation.

Owing to the fine state of division the liquid undergoes when leaving the nozzles, the gaseous constituents of the solution are said to be "immediately eliminated and pass out at A^1 to be further dealt with in any desirable manner."

To prevent the liquid leaving at A^1 along with the gaseous products, baffle-plates I, I^1, I^2 (fig. 2), or perforated diaphragms J, J^1 (fig. 1), may be arranged as shown.

When dealing with solutions containing solids, it may be desirable to pass them through a screen fitted in the pipe main C feeding the apparatus; and, in treating liquids requiring an alkali for decomposition of the "fixed" ammonia salts, it is preferable to pass them into a smaller vessel (as N, fig. 1), the alkali being added by a pipe K. A steam-jet L may be used to agitate the contents of the vessel.

In fig. 1, the liquid is sprayed in a chamber A, and by virtue of the valve A^2 governing the outlet a pressure is set up in the chamber; and as the chamber is in communication, by the liquid discharge B, with the chamber N, the pressure contained within it is conveyed to N, and is thus enabled to cause the liquid in it to be sprayed in the second chamber A^3.

In fig. 2, the liquor discharge B communicates directly with the jets in the chamber A^3, so that the pressure in the chamber A is enabled to directly spray the liquid in the chamber A^3. In like manner the pressure in the chamber A^3 is enabled to directly spray the liquid in the chamber A^4, by the pipe B^1; the pressures being maintained in the chambers by valves M, M^1, M^2 controlling the outlets. The apparatus shown in fig. 2 may be worked by vacuum or by both pressure and vacuum, in which case the central chamber in the case of three chambers would conveniently be at approximately atmospheric pressure.

A pump is connected to the outlet T of the last chamber to finally remove the solution after its gaseous constituents are eliminated.

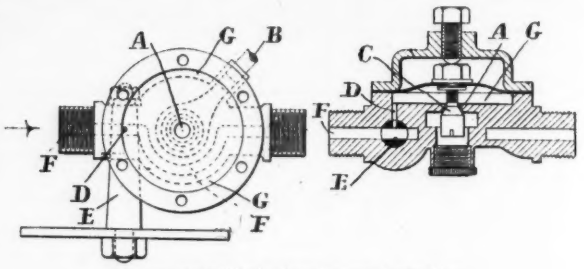
Controlling the Supply of Gas to Burners.

BROWN, T. W., of Harringay, and TILLEY, F. C., of Kingsland Road, N.E.

No. 5842; March 8, 1911.

This gas-governing apparatus effects the control of the supply of gas to the bye-pass through the intermediary of a diaphragm "of improved construction."

In the casing shown is a hole A, which leads through another passage or chamber on the outside of the box to a bye-pass B; the hole being controlled by a valve C carried by a flexible diaphragm. There is also a small hole D leading from the valve casing into the main casing. The plug or valve E is of a two-way kind; and its casing and outlet are provided with a screw stem for connection to the gas supply. The cover is provided with a screw rod acting upon the valve stem C to regulate the closing of the valve and thus determine the length of flame at the bye-pass burner whether the gas is turned on or off.



Brown and Tilley's Gas-Burner Controller.

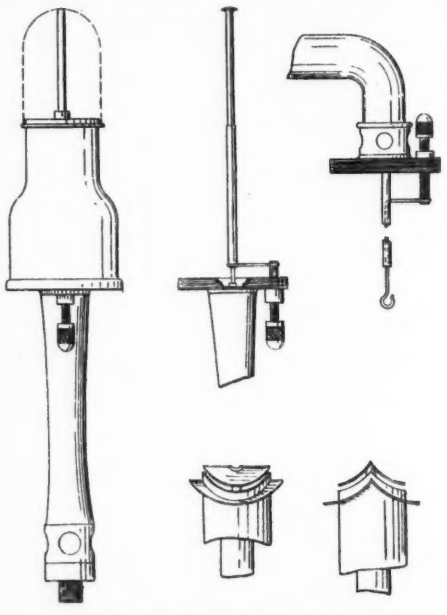
When the plug or valve E is turned for the gas to pass to the main burner, the main body of gas passes through the passage F and some through the hole D into the box G, and by the valve opening A and away to the bye-pass burner. The pressure of gas acting on the diaphragm controls the outlet from the box C by the valve; while if the valve is turned to cut off the supply to the main burner, the gas still passes to the box G and bye-pass—any extra pressure of gas acting upon the diaphragm to further close the valve and regulate the flame at the bye-pass. Should, however, the pressure of gas be lowered to normal, the diaphragm will open the valve C, but the flame will still be of the same length.

Device for Preserving Incandescent Mantles.

SPARKS, E., of Tufnell Park, N.

No. 11,525; May 12, 1911. No. 16,710; July 20, 1911.

This combined invention, in reference to incandescent gas-burners, is thus referred to by the patentee: It is well known to provide an incandescent mantle with a crutch or support from which the mantle is suspended; and this crutch or support has in some cases been made adjustable as to length by means of a rack-and-pinion movement or the like. Where made adjustable, however, the crutch or support was



Sparks' Mantle Adjuster for Gas-Burners.

arranged outside the mantle. It has also been proposed to allow the open end of the mantle to rest upon a shelf or collar mounted around the burner mouth, with the idea of prolonging the life of the mantle by protecting it from vibration. Moreover, in one form the crutch was made of a rod adapted to slide in a tube so that mantles of different length might be fitted thereto. In this arrangement a coned collar was employed as a support for the base of the mantle; but no mechanical provision was made for adjusting the length of the crutch in use, so that when in position the mantle might be easily lowered further on to its coned collar. According to the present invention, I employ for the end of the mantle remote from the burner a support which passes up inside the mantle, and in conjunction with such interior support I may employ a ledge for the opposite end of the mantle (the open end). This ledge is preferably scalloped or undulated—the open end of the mantle being correspondingly shaped. By means, in addition, of a suitable adjusting device, the distance between the two supports for the mantle can be lessened when required. I am thus enabled, when the mantle is in position, to adjust

accurately the relative positions of the two supports for the mantle For example, by means of an adjustable support inside the mantle (the length of which support is controllable by means of a micrometer screw device), I may bring the mantle from time to time closer to the ledge or shelf, so that the open end of the mantle can be maintained constantly against its engaging ledge.

The illustration shows an elevation of a Kern burner, with the china rod, the device for altering the height of the rod, and a horizontal ledge for the burner. A part view of the china rod, the support, and the adjusting screw. A modification for an inverted-mantle burner. Also elevations at right angles one to the other of the undulated or scalloped ledge for the mantle, showing also a deflecting cap. These do not need any detailed description.

Recovery of Sulphur from Materials Employed in the Manufacture of Gas.

Société H. Gouthière et Cie., and Pierre Ducancel, of Reims, France.

No. 13,383; June 3, 1911. Date claimed under International Convention, June 7, 1910.

This invention relates to a process for extracting sulphur from certain industrial residues such as the spent materials which have been used in the purification of illuminating gas, the residues from the manufacture of Chardonnet silk, &c. Such processes, the patentees remark, for the treatment of spent materials have previously been proposed, involving the use of ammoniacal liquor as a treating agent so as to convert the sulphur in the spent materials into the form of ammonium polysulphide, which is afterwards subjected to further treatment for the recovery of the sulphur in a commercial form. Ammoniacal liquor, however, as usually obtained from the manufacture of illuminating gas, is, it is pointed out, of somewhat widely varying composition, with the result that the amount of sulphur converted into the form of polysulphide varies with different conditions, and the yield of sulphur obtained is in any case small in comparison with the amount of ammoniacal liquor required.

The process of the present invention utilizes in a similar manner the two following general principles—namely: A. The extraction of the sulphur from the spent material by means of ammonium sulphide or sulphydrate, in order to form a soluble polysulphide. B. The decomposition of the polysulphide obtained in this manner by treatment in such a way as to re-form directly the ammonium sulphide or sulphydrate on the one hand and, on the other hand, to obtain the sulphur in a commercial form.

The treatment described may be applied either to spent materials containing cyanides or to spent materials substantially free from these compounds.

Treatment of Spent Materials Substantially Free from Cyanides.

These materials are generally chiefly composed of sulphur, iron oxide, sulphate of lime, wood saw-dust, carbonate of lime, traces of Prussian blue, &c. By treating such a mixture with ammonium sulphide or sulphydrate, a polysulphide solution is obtained containing sulphur and a residue constituted of iron sulphide (Fe_2S_3), sulphate and carbonate of lime, and wood saw-dust. The iron oxide (Fe_2O_3) of the original material has become sulphuretted and transformed into iron sulphide (Fe_2S_3) by desulphuretting a portion of the ammonium sulphide. It is therefore necessary to recover this amount of sulphuretted hydrogen; and this is done by the process hereafter described. On the other hand, if the materials are treated by alkaline ammonium sulphide, the Prussian blue is dissolved in the form of ammonium ferrocyanide; while if acid ammonium sulphide or ammonium sulphydrate is used, the Prussian blue is not dissolved, and there is consequently no appreciable fixation of ammonia.

In practice, the following method of operation may be carried out: The spent materials free from cyanogen are treated, preferably in a cold state, by a suitable amount of a solution of ammonium sulphydrate. The treatment may take place in closed iron vats provided with mechanical agitators; and it is effected in a methodical manner, in a suitable plant, so as to obtain as complete an extraction as possible of the sulphur. The solution of ammonium polysulphide is then separated by filtration, and the insoluble residue is afterwards washed with water; the small quantity of this employed being used over again. Finally, one obtains: (*a*) A solution of ammonium polysulphide; (*b*) a solid residue.

a. The solution of ammonium polysulphide is distilled in apparatus similar to that used in the ammonia industry. The ammonium sulphide is recovered from the distillate, and can be used again for treating a fresh quantity of material. The residual liquid from the distillation contains sulphur in a precipitated form, which is separated by filtration and washing. In this manner sulphur is obtained, the purity of which is already 96 to 98 per cent., and which may be supplied in this form direct to the consumers, or it may be refined by the usual processes and a yellowish sulphur obtained of a purity equal to that of commercial refined sulphur.

b. The solid residue is principally composed of iron sulphide (Fe_2S_3), sulphate and carbonate of lime, wood saw-dust, &c. It is from this residue that the sulphuretted hydrogen obtained by desulphuretting ammonium sulphide is obtained and fixed by iron oxide (Fe_2O_3).

The operation is as follows: The solid residue, after having been oxidized by the air, is treated by a wash of lime in order to form calcium sulphides, which, decomposed by a current of carbon dioxide obtained from a lime kiln, give off sulphuretted hydrogen which is supplied to the solution of ammonium sulphide to form the original ammonium sulphydrate. The final residue is composed of renewed purifying material, which may be used afresh for the refining of illuminating gas.

Treatment of Spent Material Containing Cyanogen.

These spent materials obtained from the chemical refiners in gas-works are generally chiefly composed of sulphur, iron sulphide, sulphate and carbonate of lime, wood saw-dust, Prussian blue, ferrocyanides, sulphocyanides, &c. By treating such a mixture with ammonium sulphide containing preferably an excess of ammonia, a solution of ammonium polysulphide is obtained containing sulphur, dissolved Prussian blue, ferrocyanides, and sulphocyanides of ammonium. The treatment is effected under the same conditions and with the same apparatus as those used for the extraction of sulphur from spent materials free from cyanogen. As the iron is already in the form of sulphide (Fe_2S_3), there is no appreciable desulphuretting of the ammonium sulphide. It is therefore not necessary to pay attention to the recovery of the sulphuretted hydrogen. On the other hand, the residual liquid resulting from the separation of the sulphur contains ferrocyanides and sulphocyanides of ammonium, which can be extracted, as also the ammonia, by known means—the recovered ammonia being used afresh. Finally, the residue coming from the treatment by ammonium sulphide is chiefly composed of iron sulphide (Fe_2S_3), sulphate and carbonate of lime, wood saw-dust, &c. By oxidation in the atmosphere, a renewed purifying material is obtained, which can be used again for the purification of the illuminating gas.

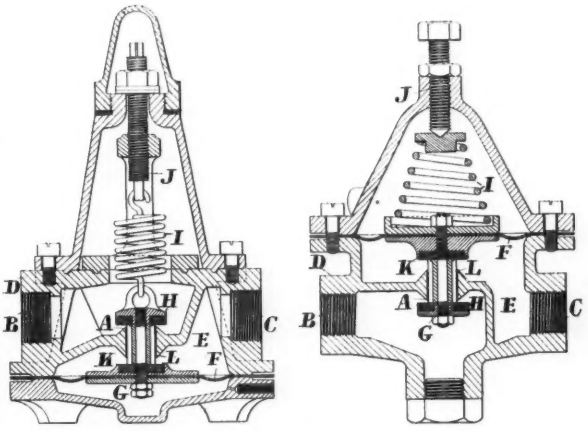
This process can be used with advantage directly in the gas-works by treating the spent materials coming from the chemical refiners. It will permit of the simultaneous extraction of sulphur and Prussian blue and the regeneration of the spent purifying materials.

Gas-Pressure Governors.

Short, A. J., of Edgbaston, Birmingham.

No. 14,560; June 20, 1911.

This gas-pressure governor is of the type in which spring-controlled valves and a diaphragm are employed to automatically interrupt the gas-flow both when the pressure on the outlet side rises above and falls below predetermined limits.



Short's Gas-Pressure Governors.

Two forms of gas-pressure governors constructed in accordance with the invention are shown.

A valve seating A is arranged between an inlet B and an outlet C in a valve-box D; and in the chamber E beneath is a flexible diaphragm F, connected by a stem G with the principal valve H, which is acted upon by an axially arranged tension spring I, adjustable by a screw J. In conjunction with the diaphragm is an auxiliary valve K, which can co-operate with a supplementary seating L for interrupting the gas-flow through the valve box.

The relative position shown for the valves, diaphragm, and seating is that taken up when the gas pressure on the outlet side of the valve box lies between the limits for which the governor is adjusted. When the supply is cut off by a valve in the service main on the inlet side of the governor, the spring draws up the auxiliary valve K into contact with the supplementary seating L. This also occurs when the gas pressure on the outlet side falls below the minimum which maintains the flow through the governor—as, for example, in the event of rapid escape or of perforation of the diaphragm. Under ordinary pressure the valve reopens; but as soon as this occurs, the pressure is relieved by the consequent escape of gas past the valve and the valve re-closes under the action of the spring. Alternate momentary opening and closing continues; but "the amount of gas permitted to pass in this process is insignificant as compared with the unimpeded outrush which occurs when no such auxiliary valve is employed."

Under normal conditions, the valve K remains open under the action of the pressure on its upper side, and gas passes through to the outlet. Fluctuations of pressure between the limits for which the apparatus is constructed merely cause vertical upward or downward movements of valves under the action of the pressure on the diaphragm, and thereby cause the gas-flow past the valve seatings to be varied accordingly. But if the pressure on the diaphragm becomes excessive, it draws the main valve H on its seating against the spring I as before, until the pressure on the outlet side of the governor subsides sufficiently to enable the spring to re-open the valve. Gas-flow through the governor is therefore interrupted both when the pressure exceeds one limit and falls below another limit.

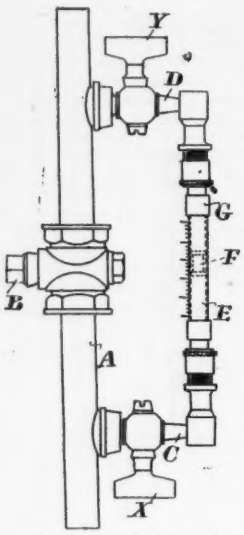
A governor as described is more especially applicable to high-pressure gas-service mains.

In the modification, a compression spring is employed instead of a tension spring, and is arranged to act directly on the diaphragm. This arrangement is the second one shown. The action and construction are substantially the same as that above described, with the exception that the spring operates differently and is differently arranged.

Measuring Leakages in Gas Conduits.

CREMER, H., and HEINRICHS, P., of Aachen, Germany.

No. 18,801; Aug. 21, 1911. Date claimed under International Convention, Aug. 22, 1910.



Cremer and Heinrichs' Gas-Leak Indicator.

According to this invention, a pipe enclosing a buoyant member or float is bridged in the main piping between the leak and the main gas supply; and, on closing the secondary cocks and opening the main cock, any leakage in the piping will be seen from the movement of the float, and can be quantitatively determined.

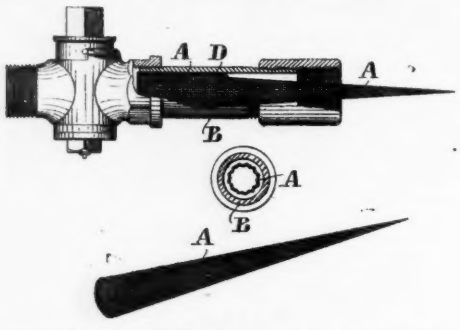
A is a pipe connected with the gas-meter or with a pipe between the leak and the gas-supply cock. B is a cut-off cock in front of the leak, or it may constitute the main gas-supply cock. The tube A is provided in front of, and behind, the cock B with connections C D provided with cocks X Y. Bridged between the connections C D is a measuring tube G, provided with a calibrated glass E, and in which is a float. On closing the cock B and the auxiliary cocks behind it, and opening the cocks X Y, any leakage in the pipe A will be indicated by gas flowing through the tube E raising the float. If the tube E is conically formed or widens at its upper end, the float will serve to determine the flow of gas through the tube E, and thus enable the leak to be quantitatively determined from the calibrations.

Preventing the Choking of Gas-Pipes by Naphthalene.

EVERY, J. W., of Stoke Newington, N., and KEMPTON, C. H., of South Lambeth Road, S.E.

No. 24,168; Oct. 31, 1911.

To prevent the deposit of naphthalene from choking gas-cocks and the like, the patentees propose to provide on the entrance side of the cock an elongated perforated screen (of conical or tapered form) which terminates at its free end in a point or edge so as to present practically no obstruction in the pipe, while the length is such that "even a large accumulation of naphthalene at one end or part of the screen will not prevent a free flow of the gas at the other part or end."



Every and Kempton's Naphthalene Screen for Gas-Cocks.

The "check screen" employed consists of an elongated cone A, of copper or metal gauze, of considerable length in relation to its width and in relation to the area of the gas-pipe B to which it is fitted. The screen is fixed just inside the service-pipe B, close to the cock, so as to prevent the naphthalene entering. The pointed end of the screen is presented towards the direction from which the gas flows, "whereby any accumulation of naphthalene will occur at or about the base of the cone . . . for example, as indicated at D, thereby leaving the apex and smaller end of the screen free and unobstructed to admit of sufficient flow of gas to the cock." By the elongated conical form, "the surface of which runs at a very acute angle to the axis of the gas-pipe," the naphthalene will, it is said, freely travel along the surface of the screen, and is arrested at the larger end.

The screen shown consists of a plain wire gauze cone, the base of which is about (or slightly larger than) the diameter of the service-pipe; and in use it is merely inserted in the end of the service-pipe with the point inwards and the cock or union joint screwed up in the ordinary way. A cross bar may be fitted to the screen whereby it can be more conveniently drawn out should it become tightly fixed.

Cowes Gas Undertaking.—The annual accounts of the gas undertaking of the Cowes Urban District Council show that, since the acquisition of the works by the Council, about £20,000 has been paid off on the loan, which now amounts to £50,000. The revenue in the past financial year increased by about £530; the balance of profit amounting to nearly £4000. This is not quite equal to the profits of the year 1910-11, which is accounted for by £1709 having been spent on repairs.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Spiral-Guided Gasholders.

SIR,—I read with great interest the paper by Mr. T. Duxbury, at the recent meeting of the Manchester District Institution, on spiral-guided gasholders in general, and those he has erected at Oldham in particular; and I thank him for his kindly appreciation of my work. There is, however, one point I should like to bring to his and the profession's notice, on which there may be some little confusion.

In the specification of my 1887 patent, it is clearly affirmed that the spiral rails may be attached either to the inner face of the tank or to the outer face of the holder. This latter was not, therefore, a subsequent invention, as Mr. Duxbury may very possibly imagine. In constructing the first, we had to choose which method to adopt; and I may say the chief reason I had for favouring the design for Northwich was to placate as far as possible those æsthetic critics who, at the various meetings, had thought a simple gasholder bell would disfigure a landscape, while one with columns around it was considered a veritable "thing of beauty." I have to confess that, with the modicum of the artistic mind with which I am blessed, I am utterly unable to see "beauty" of any kind in a gasholder, whatever its design or mechanical construction may be.

In conclusion, I can only reiterate to-day what I affirmed twenty-five years ago—that, in my sincere opinion, a spiral holder, whether with inner or outer rails, is far more stable than one guided by vertical rails alone can possibly be. My latest invention will not detract from this stability, but will further simplify the construction.

W. GADD.

Manchester, May 25, 1912.

Muffle Furnaces and Temperatures.

SIR,—The "JOURNAL" for the 14th ult. contains the *précis* of Dr. Bone's lecture at the Leeds University on the 7th ult. on "Surface Combustion" and its application to industrial heating. The theoretical aspect of the subject, not to mention the practical tests carried out by the Doctor, enforces a deep interest on all who are concerned with the gas-furnace business.

One would like to ask, at this juncture, whether a muffle proper, as shown in Dr. Bone's drawing of a muffle furnace on p. 433 of the "JOURNAL," is a necessary and integral part of an oven or muffle furnace.

I notice Dr. Bone mentions 1055° C. as being the maximum temperature obtainable in a muffle which he described as of "modern design." Natural-draught furnaces, both muffle and oven type, have been designed and supplied, having the flame-contact principle to which Dr. Bone refers, in which temperatures up to 1350° C. and more have been obtained on a reasonably low gas consumption. The muffle to which Dr. Bone refers for the results given measured 9½ in. by 5¼ in. by 3¼ in.; the floor, sides, and top area would equal about 195 square inches; and the gas consumption is stated at 58 cubic feet to maintain a temperature of 1205° C. in the middle of the muffle. A Richmond regenerative muffle furnace for pottery work was subjected to a seven-hour test a short time ago before the English Ceramic Society, at Hanley. The muffle measured 33 in. by 12 in. by 12 in.; the floor, sides, and top areas would equal about 1872 square inches; and the gas consumption was less than 450 cubic feet per hour to maintain a temperature of 1300° C. in the centre of the muffle. As will be seen, the comparative result is largely in favour of the Richmond muffle; but I am quite prepared to think that had Dr. Bone given us some particulars of tests from a large furnace, the comparative result might have been different.

Mr. E. W. Smith, M.Sc., of Birmingham, has made numerous tests in Richmond natural-draught oven furnaces measuring inside 36 in. by 24 in. by 12 in.; and the results are interesting:—

Temperature. Deg. C.	Time to Attain. Minutes.	Gas Consumption per Hour. To Heat Up.	To Maintain.
650	45	500 cubic feet	130 cubic feet
750	60	500 " "	150 " "
1000	90	500 " "	200 " "
1300	180	500 " "	500 " "

E. P. TAUDEVIN.

15, *Roseberry Road, Muswell Hill, N., June* 1, 1912.

Alliance and Dublin Gas Company.

SIR,—In your issue of yesterday's date is a letter, signed "Nonulus." I am a considerable shareholder in Dublin gas; and, like your correspondent, I cannot understand why this Company's stock, on which 5 per cent. has been paid, is below 80.

I inquired and looked into the position of the Company lately, with the following results:—

1.—The profit for the year 1911 was £2680 less than the 5 per cent. dividend paid; but £7000 was paid out of profits towards the new retort-houses. There is £21,082 still to write off profits for the cost of these.

2.—£28,759 was owing to the bank on Dec. 31, 1911—no doubt partly on new retort-houses account. The new retort-houses have been put into the Dublin works, with very satisfactory results; and in December, 1911, the Company were putting new retort-houses into the Kingstown works.

3.—This year (1912) is the last year when the Company are compelled, under their last Act of Parliament, to reduce the price of gas by 3d. per 1000 cubic feet. Whether they will advance the price in 1913 will depend upon circumstances. The electrical-works in Dublin have cost so much that they cannot compete strongly with gas. The 3d. per 1000 more for gas would be £15,000 to £18,000 per annum.

I have submitted the accounts for 1911 to a friend, who is manager of large gas-works; and he sees no reason why 5 per cent. should not

be made—especially with gas so high in price as 3s. 7d. or even 3s. 4d. per 1000.

Some time ago, it was rumoured that the management were not working cordially together. I understand that a better state of things now prevails.

If the Dublin Gas Company paid only 4 per cent., the stock ought to be worth 80. The profits would have to decline £12,000 from the year 1911 before they were only 4 per cent. on the capital.

"Nonulus" might write the Company, asking what evils justify the low price for their stock, and ask if these evils cannot be removed. The only thing in addition that could be done would be to attend, or send to, the next shareholders' meeting.

May 29, 1912. D. L.

What a Penny will Do.

SIR,—Referring to the paragraph, headed as above, in the current issue of the "JOURNAL," I think that—in spite of your correspondent's strictures—your comments of May 14 last (p. 465) upon my recent advertisements will be found to be fully justified by the facts.

I enclose three circulars issued by me in 1902, 1903, and 1906 respectively, each of which embodies a schedule of "What a Penny will Do," and can, of course, claim a priority of several years to your correspondent's circular of 1909.

I believe, however (although, writing from memory, I may be mistaken), that in 1902 I saw a somewhat similar schedule issued by the Gaslight and Coke Company; and that, before preparing my own circular, I asked for, and readily obtained, the approval of the then Secretary of that Company (either Mr. Field or Mr. Milne Watson, I do not now remember which).

The originality, and the matter of reservation of rights, however, apply quite as much to the form as to the matter of these advertisements—which I think your correspondent will readily admit if (upon his communicating with me) I send him a copy of the circular you more particularly refer to.

Chichester, May 30, 1912. T. E. PYE.

LEGAL INTELLIGENCE.

Settlement of the Colne Valley Water-Pollution Case.

We understand that an amicable settlement has been come to in the action brought by the Colne Valley Water Company against the Watford Gas Company in respect of the percolation into the plaintiffs' works of water from a leaky gasholder tank [see *ante*, pp. 455, 529]. The terms include a large expenditure on the part of the Gas Company to obviate any possible danger arising in the future from the cause mentioned; and a small amount is being contributed by the Water Company towards the cost of new works to be put in hand at once.

Dispute Regarding a Water-Meter.

At the Walsall County Court on May 22, the South Staffordshire Water-Works Company sued Messrs. Handford, Greatrex, and Co., tanners, of Walsall, for £37 for a quarter's water supply. The case for the plaintiffs was that, though defendants disputed that they had consumed the quantity of water for which they were charged, the meter, when tested at the Company's testing-station at Tipton, was found to be practically accurate, but actually registered 4 per cent. against the Water Company. Mr. H. Ashton Hill, Chief Engineer to the plaintiffs, said he had personally examined the meter, and was unable to find anything which would cause it to at any time register too fast. It was, in his opinion, mechanically impossible for a meter to at one time register slow and at another time fast. In cross-examination, he said he was aware defendants suggested that the meter should be tested before it was removed from their premises; but he did not think this desirable; and under their parliamentary powers plaintiffs could take the meter away and test it as they thought best. He agreed that the Company's inspector could have tested the meter at defendants' works had he chosen. For the defence, it was stated that the firm's average consumption of water was about £5 a quarter; and that a jump to £37 could only be explained by the meter having registered inaccurately. It was tested by the firm's managing foreman, and found to be registering an excessive amount; and defendants only consented to the removal of the meter on an assurance that the Water Company would settle on an average of the consumption for the preceding two years. But for this, they would have called in an independent engineer to test the meter at the works. His Honour Judge Smith said it was impossible for him to believe defendants would, without any apparent reason, increase their consumption of water by six times the usual amount. He was of opinion the £7 paid into Court was an adequate amount; and he gave judgment for the defendants, with costs.

A Tell-Tale Gas Explosion at Halifax.—John Thomas Pulman (25), electrician, appeared in custody at the Halifax Police Court last Wednesday charged with stealing gas on the 9th of March and other dates. It was stated that though the gas at a certain house was cut off at the meter twelve months ago, the prisoner had been burning gas there throughout this period. An explosion on the date named revealed the fact that the inlet and outlet pipes were disconnected from the meter and joined by an india-rubber pipe, so that a supply of gas was obtained without passing through the meter. The prisoner, who had been convicted previously for breaking and entering, was fined £2 and costs—the alternative being a month's imprisonment. The Chairman (Dr. West-Symes) said the Magistrates considered the theft an impudent fraud, and were sorry they could not inflict a heavier penalty.

MISCELLANEOUS NEWS.

BRITISH GASLIGHT COMPANY AND THEIR WORKMEN.

Medals and Awards for Long Service.

It may be remembered that early in the present year a number of the employees at the Norwich station of the British Gaslight Company were presented by the Directors with medals and certificates in recognition of their long service with the Company. A similar interesting event took place last Wednesday, when the Chairman of the Company (Mr. J. Horsley Palmer) visited Hull, and made awards to 76 officials and workmen engaged at the station in that town. Most of the recipients had long since completed 25 years' service; but in one case—that of Mr. William Lovatt, the Chief Clerk at the Baker Street offices—there was a record of 44 years, and Mr. Lovatt is still on the active list. Several of the workmen were pensioners—one having joined the Company in 1858, and another being upwards of 80 years of age.

Mr. Horsley Palmer said, as Chairman of the Imperial Continental Gas Association, he had taken part in many gatherings of a like nature to the present on the Continent, and he had been impressed with the deep veneration for long service which was shown there. When he suggested to his co-Directors that a similar system of recognition should be inaugurated in connection with their employees, some of them thought that the English workmen did not care for this sort of thing. But he "stuck to his guns," and had gained the day. He hoped the medals awarded would be a source of great enjoyment to the men and their families. He assured the men that the Directors always had their interests at heart; and he expressed the hope that many of them would reach their fiftieth year of service.

Mr. John Young, the Engineer and Manager of the station, was the recipient of one of the silver medals, and also of a handsomely mounted certificate—he having completed 25 years' service with the Company. Among the other officials who was similarly honoured was Mr. John Robert Warren, the Outdoor Superintendent; while Mr. James Cox, who joined the Company in 1862, and is now on the pension list, was also rewarded. There were upwards of fifty men who had completed 25 years' service, and are still employed at the works. The Directors presented each of these men with £5, in addition to giving them a long-service medal and certificate.

At the close, a vote of thanks to Mr. Palmer and the Directors for their generosity was proposed by Mr. Young, seconded by Mr. Arthur Cartledge (Foreman of the Coke Yard), and heartily carried.

Mr. Cartledge, in his speech, referred to one of the mottoes which decorated the walls—"Friendship Reigns Supreme"—as expressing the spirit which prevailed between the workmen, the officials, and the Directors of the Company. The kindness and thoughtfulness of the Directors, and the interest they took in the welfare of the staff, were thoroughly appreciated by the workmen. He felt sure that if a similarly good understanding existed in other companies and trades, nothing would be heard of the unrest which was unfortunately at the present time disturbing the labour world.

Mr. Horsley Palmer, in responding, said that he was glad that such a spirit of harmony prevailed at the Hull station; and the Directors were gratified to know that the officials were carrying out the Directors' wishes in encouraging such friendly relations between the several members of the staff.

Light refreshments were served, and a musical programme was gone through.

SOUTH AFRICAN LIGHTING ASSOCIATION, LIMITED.

Improved Position and Outlook—Higher Dividend—Native Coal for Gas Making.

The Ordinary General Meeting of the Company was held on Wednesday last, at the London Offices, No. 90, Cannon Street, E.C.—Sir DANIEL F. GODDARD, M.P., in the chair.

The SECRETARY (Mr. William Cash, F.C.A.), having read the notice calling the meeting, the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he thought they might all congratulate themselves on the results of the past year's working. It showed a considerable improvement on the preceding year; and he did not think he would be too sanguine in saying that the Board were hopeful that the Company had now quite reached the bottom of their bad trade. At Port Elizabeth, there had been a slight decrease—5·6 per cent.—in the quantity of gas sold; but since the close of the year, nearly every monthly account showed a slight increase on last year's returns. The monthly report they had before them that morning disclosed a considerable increase over the corresponding month of 1911. At Grahamstown, the consumption of gas continued to advance. There the Company were doing very well, having had an increase of rather more than 5 per cent. During the year, they had been able to effect considerable economies in working; amounting, at Port Elizabeth, to something like £1400. This was partly due to coal. Of course, they had used less, as they had sent out less gas. The saving was also due to some economies in salaries. Then they had shut-down the water-gas plant, because it was found they could make gas cheaper from coal now than by importing oil for water gas. Further, some £500 had been saved in repairs on mains during the year. So that, altogether, the items represented a considerable amount to the good. At Grahamstown, there had been increased profit; and affairs looked so well in the town that the Directors reduced the price of gas there by 5d. per 1000 cubic feet from Jan. 1 last. It would also be noticed that, while the Board had this year added £1000 to the reserve fund, they had taken from the fund £500 in order to write-down investments. This did not quite write-down investments to their present market value; but, if there was no rise in

them, he thought it was probable the Board would have to take another £500 next year. Their Manager (Mr. William Arnott) was now over in this country on leave; and the Board had had several opportunities of consulting with him, and getting to know all about the undertaking. In his absence, they had sent out a young man—Mr. J. W. Brown—who was putting a great deal of energy and new life into the work. He (the Chairman) thought that perhaps this little change for a time would be very beneficial to the undertaking. He might say with regard to the consumption of gas that, although there had been a decrease in the consumption at Port Elizabeth, the number of consumers continued to increase. There had, in fact, been an increase of 141 in Port Elizabeth during the past year, and of 44 at Grahamstown. So that, notwithstanding the strenuous rivalry they had with the electric light, they were still able to get new consumers for heating and business of this sort. The unaccounted-for gas showed an improvement on last year. It was, it would be remembered, rather high then; but it had been reduced by 1½ per cent. during this year's working. He forgot whether he mentioned this point last year; but it was discovered that a proportion of the unaccounted-for gas was not due to faulty services or mains, but to tampering with the meters in use. It was a very serious thing with which they had to grapple as well as they could. The meter makers had sent out a man for the purpose; and the Board had sent over appliances for the prevention of this kind of thing. He had mentioned on several occasions, at meetings of shareholders, the ammonia plant they had put up. The original purpose for which the plant was erected was of no avail, because the large cold-stores in South Africa did not seem now to be in such demand as they were—at any rate, there was no demand for the ammonia. Now they were making a commercial ammonia, which they were selling, and on which they were realizing quite a substantial profit—of course, in a small way of business; but it was satisfactory to know that they were not making a loss, but a profit upon it. Another matter which he thought would be interesting to the shareholders was the question of native coal. The Board had always had the idea of getting native coal; but, in the first place, the samples they had had did not show very satisfactory results in carbonization; and there were some difficulties in getting it to Port Elizabeth. He was glad to say recent inquiries and investigations had brought this matter a great deal nearer fruition; and he did think that, before long, they would be able to get a good quality local coal at Port Elizabeth, which would save considerably in cost, and he hoped would in no way deteriorate the results that they were at present obtaining from English coal. It would be of great advantage to them if they could use, at all events, some considerable portion of their coal from local sources, instead of sending it all the way from home. In regard to the coal supply, the Board had been fortunate in making contracts—notwithstanding the strike, and the great rise in price which many gas companies had to pay in this country—at only 1s. 3d. per ton advance on the previous year. This was very satisfactory. The works and plant were reported to be in excellent order; and he thought the results of the working showed they were doing very well there. The dividend, as was seen by the report, had been increased to 7½ per cent. He thought he might fairly say they could have paid a little more; but they had resolved to increase the carry-forward by nearly £700. The cautious path was perhaps the safer one; and it was better to go by degrees than run the risk of having to go back a little. As he had also said, they were maintaining the reserve fund by adding £1000 to it. Therefore, he might say the undertaking was in a very healthy and prosperous state; and upon the result of the year's working, he congratulated the shareholders.

Mr. Andrew L. Don seconded the motion, which was unanimously carried.

Proposed by the Chairman, and seconded by Mr. James Macalister, a dividend of 7½ per cent., free of income-tax, for the year was declared, less the interim payment.

On the motion of the Chairman, seconded by Mr. Henry Woodall, Mr. Macalister (the retiring Director) was re-elected to his seat at the Board. Mr. Woodall mentioned that Mr. Macalister's knowledge of men and places in South Africa was something extraordinary; and he had therefore been of great service to the Company.

Moved by Mr. G. Crispe Whiteley, and seconded by Mr. A. J. Kingdom, Mr. P. D. Griffiths, F.C.A., was re-appointed Auditor.

Mr. Whiteley moved a vote of thanks to the Chairman and Directors and staff for their efforts in improving the position and carrying on the work of the Association. The shareholders congratulated the Board very heartily on the improved state of affairs; and they hoped they had now got to the end of their troubles. He suggested to the Board that they should not err too much on the side of caution with reference to the dividend, though, of course, their first care must be the stability of the Association. The vote of thanks included Mr. Brown, who, they had heard, was showing a large amount of energy in South Africa. He should like Mr. Brown to know that they absolutely included him in this omnibus resolution; and that they were able to compliment him, as well as everyone else, upon the improved state of affairs.

Mr. James Cloudesley, in seconding, remarked that perhaps a too dismal view was taken of the position of the Company's affairs during the past year or two. Some of the shareholders sacrificed their shares; but he hoped that, with the turn for the better, the concern would now gradually come up to its old position.

The motion was unanimously carried.

The Chairman said he and his colleagues were much obliged for the vote of thanks. It was a great relief to them to feel that things were going better and looking better in South Africa than they had done for some time past. He hoped that each report the Directors presented in future would be better than the present one.

A fire broke out last Wednesday on the premises of a plumber and ironmonger in the Micklegate, York. It originated in the fusing of an electric wire in the basement, which was used for storing paint and other inflammable materials. Owing to the dense smoke, the firemen had to use smoke helmets; and some members of the brigade received severe electric shocks from live wires.

PUBLIC LIGHTING OF MANCHESTER.

Suggested Appointment of a Special Committee.

Should time permit, the question of the control of public lighting in Manchester will be dealt with at the meeting of the City Council to-morrow, on the following motion by Alderman T. Walker: "That so much of the resolution adopted by the Council on the 9th of November, 1911, appointing and instructing the Gas Committee, as authorizes that Committee to determine the method of lighting to be employed in the public lighting of roads, streets, courts, and passages, be, and the same is, hereby rescinded; that a Special Committee (to be known as the Lighting Committee) be appointed, to consist of five members of the Gas Committee, five members of the Electricity Committee, and five other members of the Council (not being members of either the Gas Committee or the Electricity Committee); and that such Special Committee shall, subject to the approval of the Council, determine the method to be employed for the public lighting of all roads, streets, courts, and passages."

Referring to this matter, our Manchester Correspondent points out that it has been before the Council on several occasions, but without any definite action being decided upon. At the February meeting, objection was taken to the proposal until such time as the Council had received a report as to the respective merits of gas and electricity for street lighting purposes. It was in the early part of last year that the Council decided on such a test being made; the understanding being that the Gas Department should undertake the illumination of Mosley Street and St. Peter's Square by high-pressure gas lighting, and the Electricity Committee that of Portland Street and Albert Square, so that a comparison might be made between the two systems. It was only recently, however, that steps were taken to carry out the tests; and, as stated in the "Journal" for May 21, Mr. Jacques Abady has been engaged by the Gas Committee, and Mr. Haydn Harrison by the Electricity Committee, to prepare a joint report on the methods of lighting best adapted for local conditions. From the very first, Mr. W. Kay, the Chairman of the Gas Committee, has made it clear that he and his colleagues would welcome such a test; but he submitted that the conditions must be equal. More than once since his election as Chairman of the Gas Committee, Mr. Kay has asked the Council to settle the point as to his Committee being the lighting authority of the city. He has also impressed upon members of the Council that there are certain difficulties about the question of street lighting; the principal one being the standard of illuminating power necessary. Then there is the matter of charges. Up to the present, the Gas Committee have charged the ratepayers 2s. 3d. per 1000 cubic feet; but the price of the Electricity Committee is only 0·7d. per unit. Therefore, it is asked how the former Committee can possibly be expected, under such circumstances, to compete with the latter.

LIGHTING OF THE HOUSE OF COMMONS.

Proposed Substitution of Electric Light for Gas.

Readers are aware, from what has appeared from time to time in our "Parliamentary Intelligence," that the subject of the lighting of the House of Commons has been under consideration by the First Commissioner of Works. A proposal was made to substitute electric lighting for gas. Before making any change, however, Mr. E. Treacher Collins, F.R.C.S., was consulted; and his report, issued last Wednesday, is given below.

On April 26, 1912, I, together with Dr. Parkes, visited the Debating Chamber at the House of Commons, and inspected the present arrangements for lighting it with gas, and the proposed new arrangements for electric lighting, in order to see if the latter were in any way likely to be injurious to the eyesight of Members of Parliament. I found that the proposed electric lighting is to be effected by groups of three metal filament incandescent lamps, enclosed in a "Holophane" globe, which is placed over a square pane of ground glass having an amber tint, and an ornamental pattern on it.

Ultra-violet rays may produce irritation of the eyes. They are to a great extent cut off by the passage of light through glass, and are completely cut off by glass of an amber tint. The rays from the electric lamps at the House of Commons will be filtered by passage through three layers of glass—(1) that covering the lamp itself, (2) the "Holophane" globe, (3) the ornamental pane of glass. The ultra-violet rays will be cut off by the amber colour of the latter. There is, therefore, no fear that the eyesight of Members of Parliament will be affected by ultra-violet rays.

An amount of illumination equal to one candle-foot is the minimum amount usually considered requisite for reading purposes. I was informed that the amount of illumination on the benches with the present gas lighting is four-fifths of a candle-foot, and that the same amount or more, as I should think desirable, can be obtained with the electric lighting.

The amount of illumination in all parts of the Debating Chamber is not the same. The illumination from the roof is supplemented on the back benches by lamps fixed to the pillars in front of them. These do what I was told was required of them—*i.e.*, light up the faces of members so that they can be seen by the Speaker. They are not, however, situated in the best position to enable members on the back benches to read. For this purpose it would be desirable that the light should come from behind them.

Variations in the intensity of illumination at its source, so that there are glittering or glaring points, is often found to be a source of discomfort to the eyes. In the squares in the roof of the Debating Chamber, I found the illumination to be more uniformly diffused and freer from points of a glittering character when they were lit by electric light than when they were lit by gas. This is accounted for by the dispersion of light which is produced by the "Holophane" globes around the electric lamps.

BOLTON CORPORATION GAS UNDERTAKING.

Successful Year's Working.

At the conclusion of their annual inspection of the works and plant under their control, the members of the Gas Committee of the Bolton Corporation dined together, and at the subsequent proceedings much was said in praise of the management of the undertaking and its continued prosperity. The Deputy-Mayor (Alderman J. T. Cooper), in the course of his remarks, said those who had taken part in the inspection must be satisfied that the gas-works were quite up-to-date. Gas was supplied at a very reasonable price; and the Committee were able, as the result of a prosperous year, to hand over £20,000 in relief of rates, besides carrying forward a larger sum than was the case twelve months ago. It had lately been stated in Manchester that municipalities ought to get from trading committees in relief of the rates 3 per cent. on the capital employed; and this, he thought, was about the figure for the Bolton gas undertaking. Mr. R. Tootill, a Labour representative, said they could with confidence assert that the undertaking was exceedingly well managed—an assertion that was borne out by the results achieved. Some of this was due to Alderman Webster, the Chairman of the Gas Committee, and those who worked with him. But they had also to recognize the work of their excellent and highly qualified Engineer and Manager (Mr. W. J. Smith), who stood very high, not only in the opinion of the Committee, but of his colleagues in the gas engineering profession. The capital of the undertaking now stood at nearly £800,000; and the Committee had set aside £10,000 for depreciation, in addition to the £20,000 handed over in relief of the rates. Alderman Webster, responding to the toast of his health, mentioned that Mr. William Smith, their former Engineer and Manager, had written from his residence at Bridge of Allan (where he is living in retirement) regretting his inability to be present at the inspection of the works. In his son, said Alderman Webster, they had one of the ablest gas engineers in the kingdom. He was following in the footsteps of his father, who managed the Bolton Gas-Works for many years with great success. Mr. T. Y. Ritson, in proposing the health of the Vice-Chairman of the Gas Committee (Mr. J. H. Crook), observed that, on the past year's working, the Gas Department had established three records of which both the Committee and the Engineer might well be proud—viz., gas sold per ton of coal carbonized, total quantity sold, and lowest percentage unaccounted for. Further, they made a profit of £6000 more than in the preceding year.

ROTHERHAM CORPORATION GAS DEPARTMENT.

Engineer and General Manager's Annual Report.

The Engineer and General Manager of the Rotherham Corporation Gas Department (Mr. J. S. Naylor) has presented to the Gas Committee his report for the year ended March 31.

The quantity of coal carbonized in the year reported upon was 24,737 tons, at a cost of £13,076, or 10s. 6·86d. per ton, against 24,238 tons in 1910-11, costing £12,088, or 9s. 11·69d. per ton; being an increase of 499 tons and £998 respectively. The gas made per ton of coal was 12,717 cubic feet, against 12,605 cubic feet before; being an increase of 112 feet, which, Mr. Naylor says, constitutes a record for the department. The quantity of gas sold was 282,302,000 cubic feet, against 268,500,000 cubic feet—an increase of 13,802,000 cubic feet, or 5 per cent. The unaccounted-for gas was 27,916,000 cubic feet, or 8·8 per cent. of the make, against 32,750,000 cubic feet, or 10·70 per cent., for 1910-11—a decrease of 1·83 per cent. The prices of residuals were higher during the year—an increased sum of £607 having been received. The gas for public lighting in the borough, including wages and maintenance of lamps, amounted to £4553, against £4516 before. The cost of the gas used for street lighting was £2376, against £2447 last year—a decrease of £71, due to curtailment during the coal strike.

The amount of the gross profit made was £16,109, against £15,883—an increase of £226, notwithstanding that £1750 extra was paid for coal during the strike; and it includes £614 paid to the Sewerage Committee for coal from the sewerage works. The net profit, after allowing for interest, redemption instalments, and contribution to the sinking fund, amounted to £6635, against £6557—an increase of £78. If the gas for public lighting (£2376) is again given by the department as in former years, there remains an available surplus profit of £4260, against £4110; being an increase of £150. This is equal to 3·62d. per 1000 cubic feet of gas sold, and 3s. 5·32d. per ton of coal carbonized.

LANCASTER CORPORATION GAS UNDERTAKING.

The Past Year's Working.

At the Monthly Meeting of the Lancaster Town Council last Wednesday, the Gas Engineer and Manager (Mr. Charles Armitage, Assoc. M.Inst.C.E.) submitted his annual report. It showed that the total receipts, including bank interest, amounted to £30,892, and the expenditure to £18,868; leaving a gross profit of £12,024. Out of this sum £3319 had been paid for interest on stock and mortgages, £2010 added to the redemption fund, £706 paid for income-tax, £3800 contributed to the relief of the rates, and the balance of £2189 placed in the reserve fund, making it £12,404. From this fund, £10,000 has been transferred to the working balance account. The revenue for gas supplied through ordinary meters was £14,400—an increase of £251; through prepayment meters (of which 3208 have now been fixed), £5314, or £242 more than before. For the public lighting, 15,807,686 cubic feet of gas were supplied free of charge; being equal to a contribution of £1514 to the rates.

The average cost of coal was 11s. 3·35d. per ton, against 11s. 0·19d. in the preceding year. Coke realized 6s. 0·65d. per ton, and tar and ammoniacal liquor 4s. 3·89d. per ton; making a return for residuals of 10s. 4·54d. per ton of coal carbonized, or equal to 92·01 per cent. of the coal. The average price received per 1000 cubic feet of gas sold was 1s. 10·30d. Of this sum, gas cost 8·38d.; new mains, services and meters, 1·30d.; interest on stock mortgages, less interest per bank, 3·59d.; redemption fund, 2·27d.; contribution to rates, 4·29d.; and balance to reserve fund, 2·47d. The net cost of gas was 8·38d. per 1000 cubic feet sold. This low figure is attributed principally to the adoption of mechanical appliances for the handling of materials, favourable contracts for coal, higher prices for residual products, and economical working. Nothing was added to the capital account last year; but £1153, the cost of new mains, services, meters, and prepayment stoves, was charged direct to revenue. The total quantity of gas made was 219,824,000 cubic feet—an increase of 4,529,000 cubic feet on the preceding year. The unaccounted-for gas was 2·27 per cent.

In moving the adoption of the Gas Committee's minutes, Alderman Preston referred to the fact that the balance of profit of the gas undertaking for the past financial year was about £800 more than was estimated. There was a total net increase of £1163. The increase in the gas sold was £500, and in residuals £450; while there was a decrease in expenditure. These were all signs that the gas undertaking was flourishing, and doing well for the town. The minutes were at once confirmed.

LEIGH (LANCS.) GAS AND WATER DEPARTMENTS.

Results of the Past Year's Working.

The Engineer and Manager of the gas and water undertakings of the Leigh (Lancs.) Corporation—Mr. James Gibson—has presented his report for the year ended the 31st of March last. It furnishes the following particulars.

The gross profit in the Gas Department was £13,169, or 7·67 per cent. on the capital invested. After deducting sinking fund and interest charges, £9735 (equal to 1s. 3·628d. per 1000 cubic feet of gas sold), there was left a net profit of £3434. Out of this sum certain special charges were paid; leaving a credit balance of £3127. The quantity of coal carbonized was 13,360 tons, or 220 tons less than in the preceding year; but the bulk of gas sent out was 159,621,000 cubic feet—an increase of 4,219,000 cubic feet, or 2·71 per cent. There was an increase of 2,714,000 cubic feet, or 1·84 per cent., in the gas consumed, due mainly to the larger number of prepayment meters used, and to newly-erected manufacturing premises. In the year 1904-5, the quantity of gas consumed through ordinary and prepayment meters was 38 million cubic feet, whereas last year it was 50 millions—5 millions being used in connection with Corporation fittings. The make of gas per ton of coal carbonized was 11,474 cubic feet, or 310 cubic feet more than in 1910-11. The sale per ton of coal was 10,747 cubic feet; being the highest figure reached for several years. The yield of sulphate of ammonia was most satisfactory—26·49 lbs. being produced per ton of coal carbonized, or 1 lb. more than before. The average price was the highest received for upwards of ten years. Mr. Gibson says he has no doubt this was in a large measure due to "the endeavours of the British Sulphate of Ammonia Committee in popularizing the use of this valuable fertilizer." The quantity of tar per ton of coal was slightly more, and the coke for sale less, than before; the latter owing to the necessity for maintaining slow fires on several of the inclined settings during the coal strike. In the nine years Mr. Gibson has had the management, there has been an average saving in working costs of 3·22d. per 1000 cubic feet. On the consumption of gas for the period in question, this represents a total saving of £17,157, or an average of £1906 per annum.

With regard to the supply of water in the year covered by the report, Mr. Gibson states that there was a loss of £624, compared with £893 in 1910-11. All things considered, the lessened deficit is regarded as satisfactory. It is accounted for to a large extent by the increase in the quantity of water sold by meter. The total quantity of water received from the Liverpool Corporation was 277,737,000 gallons; and its sale produced £10,528. Taken on the population supplied—*i.e.*, 44,000—the consumption per head per day was 17·13 gallons; but leaving out the water used by meter for trade use, the quantity was 13·25 gallons per head per day for domestic purposes.

HEYWOOD GAS AND ELECTRICITY SUPPLY.

Local Government Board Inspector and Electricity Department Finance.

At the Heywood Town Hall on Friday, Mr. H. R. Hooper, Local Government Board Inspector, held an inquiry in regard to an application of the Corporation for sanction to the borrowing of £11,000 for gas-works purposes and £3000 for the Electricity Department.

The Gas Engineer and Manager (Mr. W. Whatmough) explained in detail how the £11,000 was to be expended—mainly in bringing the carbonizing plant up-to-date. He said the make of gas for the last financial year was 133,062,000 cubic feet, and the net profit £1580, out of which £800 was transferred in relief of the rates. There was no opposition to the application.

It having been explained by the Town Clerk (Mr. G. G. Bouchier) that of the £3000 required for electricity purposes £2500 was for new mains and the balance for services, the Inspector expressed the opinion there was not a sufficient prospect of revenue to warrant the capital expenditure; and he suggested that the Corporation should wait until the demand for current was such as to justify the expenditure. He pointed out that the undertaking did not appear to be making the progress it ought to do, and already had lost £8000. On last year's working there was a deficit of £2542, which had been carried forward; and he thought the Local Government Board would require this balance to be wiped out before they sanctioned any further loans.

The Chairman of the Committee (Mr. T. Ashworth) said, in explanation, that some of the extraordinary payments which they had had to

face in recent years would shortly come to an end. There was one item of £1200 which would cease this year, and others would stop within the next few years. Moreover, they had a fair number of consumers who were not shown in the last revenue account, so that the next balance-sheet would give a different result.

The Inspector asked whether it was not worth while, with some £40,000 invested in the undertaking and the possibility of an increased demand for current for power purposes, for the Corporation to have some further advice on the whole working of the undertaking; and Mr. Ashworth promised that the suggestion should be brought before the Electricity Committee.

MUNICIPAL SUPPLY OF GAS-STOVES.

Protest by Ironmongers—Defence by the Press.

In the course of the proceedings at the annual conference of the Ironmongers' Federated Association held in Glasgow last week, a paper on "New Phases of Municipal Trading" was read by Mr. R. M. Chalmers. The author complained that the evil of municipal trading went on apace—the municipalities getting hold more and more of the substance from which their ratepayers obtained the wherewithal to pay their rates. During the last twelve months, he said, they had found the Glasgow Corporation entering upon the sale of gas-fires on the hire-purchase system, and abolishing the charge for hiring gas-cookers. Hire-purchase was an evil system, and ought not to be encouraged by public authorities. Subsequent speakers supported the last statement; and in the end a resolution was adopted protesting against the increasing encroachments of municipal trading upon the rights of private traders, who were regarded as the backbone of the country.

Commenting upon the attitude taken up by the author of the paper and his colleagues, the "Municipal Journal" for Saturday last wrote: "Seeing that these gentlemen are federated ironmongers, we can only say that they have a very good opinion of themselves. We are not disposed to disagree with their proposition; but we fail to see how a business custom which is a virtue in a private individual becomes a vice when practised by a municipality. In the interests of the manufacturers of gas-fires and gas-stoves, we protest against this attempt by the federated ironmongers to restrict and handicap trade. If municipalities are not to be allowed to sell gas-fires on the hire-purchase system, then gas-fires will not be sold at all, the gas now used for these fires will not be made, workmen will be thrown out of employment, and the country will go to the dogs. If we thought these were the real views of the federated ironmongers, we should advocate the extreme course of proscribing the Association as a national menace. We do not believe, however, that they are the real views of the Association; for later on, after the annual dinner, Colonel Denny proposed the toast of the 'Ironmongers' Federated Association' in the presence of the Lord Provost. Colonel Denny tried to perform a task which Parliament has failed to accomplish—that of defining limits to municipal trading. He said: 'Where they had anything within the municipality which was common to everybody, which was a matter of common life and common necessity, such as trams, electric light, water, and gas, then by all means let the corporation deal with these things.' Now, how can the Glasgow or any other corporation deal with gas for heating purposes except through the medium of gas-fires? How can it supply electricity without wires and fittings? We think that Colonel Denny's extremely sensible speech after dinner answered Mr. Chalmers's paper before dinner."

OPPOSITION TO THE SOUTH SUBURBAN GAS BILL.

The General Purposes Committee of the Lewisham Borough Council have considered the subject of the Bill introduced by the South Suburban Gas Company, in which, among other things, they seek authority to acquire the undertakings of the Bromley and Crays Gas Company and the West Kent Gas Company. The Committee have also had before them a letter from the London County Council, stating that the Bill had been considered by a Committee of the Council, and that it had been decided, in consequence of the changes made in the Wandsworth, Wimbledon, and Epsom District Gas Bill of the present session, in providing for a standard of calorific power, with penalties for deficiencies from that standard, and dispensing with the penalties hitherto imposed in respect of testings for illuminating power, to petition against the South Suburban Gas Bill, with the view of obtaining uniformity. The County Council said it would be of great assistance to them if the co-operation of the Borough Council, as a testing authority, could be secured, and suggesting that the latter Council should deposit a petition against the Bill. It was further pointed out that clauses 34 and 35 of the Bill contain important concessions relating to the price to be charged for gas to consumers in the Bromley and West Kent districts, and that it was possible some attempt might be made by the outside authorities to obtain further concessions which might operate to the prejudice of consumers within the county, either by actually increasing the price of gas or postponing its reduction. This question would be raised in the County Council's petition, and it might also be raised in any petition presented by the Borough Council. The Committee of the Borough Council considered the clauses which have been inserted in the Wandsworth, Wimbledon, and Epsom District Gas Bill, and have generally approved of them. Owing to time, however, it would not be possible, even if they desired, to present a petition against the South Suburban Bill. But the County Council have been informed that the Borough Council think it desirable that similar clauses to those just referred to should be inserted in the South Suburban Bill; and they will support the County Council in every way possible in their endeavours to procure the amendments proposed.

The Unique Gas Lighter Company, Limited, has been registered with a capital of £1200 in 1000 preference shares (10 per cent.) of £1, and 4000 ordinary shares of 1s. each.

REPAIRS TO GAS-MAINS ON TRAMWAY ROUTES.

The Highways Committee of the London County Council have had under consideration the subject of the repair of gas-mains laid along tramway routes; and they recently submitted to the Council the following report, which has been adopted.

Section 32 of the Tramways Act, 1870, provides that nothing in the Act shall take away or abridge any power vested in any company to open or break up any road along or across which a tramway is laid for the purpose of laying down, repairing, altering, or removing any pipe for the supply of gas. The Act further provides that such company shall not be liable to pay the tramway owners any compensation for injury done to the tramways by the execution of such work, or for loss of traffic occasioned thereby. Any additional expense incurred by the company in repairing, altering, or removing their pipes by reason of the existence of tramways in any road in which the pipes were laid before the construction of the tramways is to be borne by the tramway owners, provided that the work involves interruption of the tramway traffic. This is an unsatisfactory position, and great difficulty has arisen with regard to gas-mains along the routes on the northern system. We have for some time past been in communication with the Gaslight and Coke Company, the owners of the mains, on the matter, with the result that an arrangement has now been arrived at which, in all the circumstances, we are prepared to advise the Council to enter into. We recommend: "That an agreement be entered into with the Gaslight and Coke Company providing, as regards works in roads where gas-mains were laid before the construction of the Council's tramways, (1) that the Council shall bear two-fifths of the cost of the labour charges incurred by the Company in repairing their mains situated under the tracks; (2) that the Council shall reinstate at its own cost the paving between the outer rails of the tramways; and (3) that the Company shall reinstate at their own cost the paving outside the outer tramway rails."

METROPOLITAN WATER BOARD.

The Financial Position.

At the last Meeting of the Metropolitan Water Board, the estimates for the financial year ending March 31, 1913, were presented. They showed a total income on revenue account of £2,905,480, and an expenditure of £2,980,070; leaving an anticipated deficiency of £74,590.

The Chairman of the Finance Committee (Mr. A. H. Tozer), in moving the adoption of the estimates, said the audited accounts for the year ended March 31, 1911, showed that the actual deficiency was £64,480, whereas the expected deficiency was £90,364; and it was anticipated that the actual deficiency would be approximately £71,000. In the estimates for the current year, the most important item of income was from water-rental, the net total of which was estimated at £2,819,200, or less by £1600 than the approximated income for the year 1911-12. The estimate for the previous year had been exceeded, however, by £26,300. Of this increase, nearly £18,000 was derived from meter supplies, and due to the abnormally hot and dry summer. The total income, estimated at £2,905,480, compared with an approximate income for last year of £2,915,880, or a decrease of £10,400. The expenditure, estimated at £2,980,070, compared with £2,987,260. In the drought of last year, the quantity of water supplied exceeded that of the previous year by upwards of 7000 million gallons; the total output having been 89,437 million gallons, compared with 82,171 million gallons before. The additional consumption of coal caused by the drought cost about £19,500; and the labour troubles occasioned a further increase of expense amounting to nearly £6000. The ascertained deficiencies up to March last were: 1908-9, £25,279; 1909-10, £46,076; 1910-11, £64,480; 1911-12 (approximate), £71,380—total, £207,215. Since the creation of the Board, however, there had been set aside for the redemption of new debt alone £290,530, or £83,000 more than the total deficiency; and surpluses occurred in the earlier years of the Board amounting to a further sum of nearly £30,000. The total funded debt of the Board stood at £48,664,558 at March 31 last, compared with £48,717,332 for the previous year; the decrease of £52,774 being accounted for by further cancellations of stock. The total amount of stock so purchased up to the present date was £246,878; at an actual cost of £219,719. The unfunded debt of the Board was practically the same as it was twelve months ago. The commitments on capital account at March 31 last amounted to £584,920. The Committee had before them a report of the Works and Stores Committee with reference to the provision for future supplies. The scheme foreshadowed must obviously occasion a very large expenditure, amounting ultimately to probably two or three millions of money. It was to be hoped that the efforts about to be made by the Special Committee recently appointed with a view to obtaining suitable legislation with regard to the Board's charges would result in placing the income upon such a basis as would secure a sufficient margin to enable them to cover their expenditure—not forgetting the heavy payments which would fall due in the year 1923-4 and thereafter in respect of the redemption of their hundred-year debt. Speaking generally, in his judgment the Board had done their work well; and whether viewed from the standpoint of the adequacy and purity of their supply or their financial administration, they had nothing to be ashamed of when the facts were duly considered. So far as the income was concerned, everything should be done to conserve it at its full value; while on the other side of the account, the utmost economy should be exercised, and such judicious reorganization carried into effect as would tend to reduce the expenditure, and thus enable the Board to establish itself as a paying concern.

The estimates were received.

Provision for the Future Supply of Water.

As mentioned by the Chairman of the Finance Committee in the course of his speech reported above, the Committee have had under

consideration an important report by the Works and Stores Committee on the subject of the provision of future supplies of water. The following is an abstract of the report.

By the Board's New Works Act of last session, they were invested with powers for constructing three additional reservoirs—viz., No. 5, at Stanwell, on land lying immediately to the west of the existing Staines reservoirs; and Nos. 6 and 7, on land at Littleton. It was not intended that all these reservoirs should be constructed at once, but that they should be undertaken when necessary—the first instalment being put in hand at an early date. The Committee have considered the question of the steps to be taken, and have conferred with the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) and the Deputy Chief Engineer (Mr. J. W. Restler, M.Inst.C.E.) upon reports which they laid before them, with the result that they report for the consideration of the Board a scheme for increasing the supply in the area north of the Thames which has the full approval of both the Engineers and of the Committee.

One of the first questions considered was the extent of the increased storage which should be provided for future needs. According to a table prepared by the Chief Engineer, between 1901 and 1911 the daily average requirements throughout the year increased by 24·8 million gallons; and in the summer months the increase was as much as 33·4 million gallons daily. The average daily supply during the week ending July 28, 1911, exceeded 300 million gallons. If the calculation for the storage required in 1927 were based upon the actual increase in the consumption during the summer months of last year, as compared with 1901, and upon conditions of flow in the Thames similar to those of 1899, the approximate volume of reservoir accommodation required in the Thames Valley would be some 14,600 to 15,000 million gallons, of which the Board already possess about 7000 million gallons. This total storage would suffice on the same basis of consumption for a population of (say) 7,750,000. In addition to this growth of the daily supply, there were other circumstances to be taken into account in estimating the future requirements as to storage; and, in addition, there was the Board's liability with respect to certain potential areas of supply. The Board are placed by Statute in the position of a "stand-by" to districts adjacent to their area. In these districts, the growth of population is likely to be rapid, as locomotion facilities increase, and the "centrifugal" tendency of the population is thereby encouraged.

The Chief Engineer advises that in the immediate future it is imperative that there should be greater carrying power from the Thames stations of the Board, and that the existing and additional mains should be able to convey so much water as will satisfy the demands in a period of hot weather or severe frost. During the month of August, 1911, the average daily quantity of water supplied from the Thames amounted to 167½ million gallons, which represented the safe carrying capacity of the trunk mains. During the week of maximum supply, however, about 179 million gallons a day were pumped, and the 36-inch intercommunication main from Hampton to Battersea was in full use. The total carrying capacity of the trunk mains, with this main added, is about 180 million gallons a day. It is thought, however, that this main ought to be kept in reserve, so far as possible, for conveying water temporarily where needed in an emergency.

The Committee next proceed to describe the scheme they recommend; but before going into details, they state shortly that it comprises the construction at Littleton of reservoirs Nos. 6 and 7, authorized by the Act of 1911. These reservoirs would have a joint capacity of some 7000 million gallons, they would be supplied from a new intake to be constructed below Penton Hook, and would discharge into the existing Staines aqueduct, which would convey the water to the Kempton Park station, where it would be filtered, and thence conducted into supply by a new main to be laid along the Board's existing pipe-track from Kempton to Cricklewood, with connections to a high-level service reservoir and to Shoot-up Hill, Willesden, and Ealing. This additional storage would be in excess of the Board's immediate requirements; and therefore the Committee are of opinion that at present only No. 7 reservoir, with a capacity of 3500 million gallons, need be proceeded with. This would enable the Board to postpone for two years the commencement of No. 6, and afford them a valuable opportunity of further considering and maturing the scheme for additional works. After the completion of these two reservoirs, the construction of No. 5, at Stanwell, could be undertaken, together with the necessary pumping machinery and additional filter-beds. The water from this reservoir would also be discharged into the existing Staines aqueduct, conveyed to Kempton, and filtered there just as in the case of the water from the other reservoirs.

Gas Explosion Due to Rats.—Considerable damage was done to a shop in Union Street, East Stonehouse, by an explosion of gas which occurred last Tuesday morning. The explosion followed the striking of a match to light the gas at a ring on which a kettle had been placed. Subsequent examination by the insurance assessor showed that a leakage of gas had been caused by rats having eaten through the pipe. Near the gas-ring was found a nest of rats.

Rochdale Corporation Gas Finance.—The appendix to the volume of "Abstracts and Estimates" issued by the Borough Treasurer of Rochdale contains the annual reports of the chief Committees of the Corporation. The report of the Gas Committee records that the make of gas at the Dane Street works for the twelve months totalled 645,958,000 cubic feet—an increase of 20,500,000 cubic feet on the preceding year. The sales amounted to upwards of 604,000,000 cubic feet; or nearly 22,000,000 feet more than the year before. The Committee reported that the new gas plant (the Glover-West installation of vertical retorts) which started working in October last "has been continuously at work, and yielding satisfactory results." The Committee concluded with a protest against the appropriation of practically all their surplus for the relief of rates, when the department ought to be building up a reserve fund for renewals of plant. It will be remembered that the Gas Committee offered £15,000 from the year's profits in relief of rates, which was £3000 more than was given in the previous year, and that the Finance Committee demanded an additional £1000 —a demand which was endorsed by the Council at the May meeting.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.

On Friday the ninety-sixth meeting of the Waverley Association of Gas Managers is to be held in the Cathedral Hotel, Edinburgh, at eleven o'clock. Mr. James Hamilton, of Aberlady, will preside; and an address is to be delivered by Mr. J. W. Napier, of Alloa. The new President, Secretary, Committee, and Auditor fall to be elected. After dining together, the members will spend the afternoon in a social capacity.

At the meeting on Monday of the Edinburgh and Leith Corporations' Gas Commissioners several items of interest emerged. Authority was given to the Engineer to accept from two to four patterns of gas-fires from each of the different makers who are exhibiting at the forthcoming exhibition in the Waverley Market. This collection of fires—thirty-two to thirty-six in number—is to be used as specimens for the public to choose from. The Engineer was also instructed to prepare a catalogue of the fires for distribution among consumers.

In the course of a report on suggested new forms of gas demand notes and receipt, Mr. A. Canning Williams, the Treasurer and Collector, advises the Commissioners (1) That bills for gas, residuals, fittings, &c., be separate and distinct documents, with no form of receipt attached to them. (2) That the bills, whether paid or not, be left with the consumers. (3) That receipts for the discharge of accounts for gas, residuals, fittings, &c., be separate documents, put up in book form, and each bearing a progressive number; facsimiles of the receipts issued being obtained by means of carbon paper.

Glasgow.

To-day the new system of free gas-fires was brought into operation by the Glasgow Corporation Gas Department. Hitherto gas-fires were given out on the hire-purchase system; but the fee has now been withdrawn with a view to encouraging the consumption of gas in the city and helping to clear the smoke-laden atmosphere. Last year 1545 of these fires were hired. At the present time, the total is almost 4000; and this number is likely to be greatly increased. There will, naturally, be a heavy strain on the finances of the department for some time, owing to the free system of cookers, fires, stoves, &c.; but with the restoration of the main pipes, now nearing completion, and the expected increase in the use of gas for cooking and heating, great returns are looked for.

Aberdeen.—On a report submitted by the Engineer, the Gas Committee of the Aberdeen Town Council have decided to increase the wages of the stokers and other shiftmen at the gas-works by ¼d. per hour—making them 35s. per week. The Committee considered an application by the gas inspectors for an increase; but it was decided to take no action in the matter.

Arbroath.—A joiner named Smith was found dead in a workshop near his house at Ladyloan, Arbroath. He was lying near a gas-pipe cut close to the wall. Death was due to asphyxiation by gas.

Cullen.—The new owners of the Cullen Gaslight Company propose to extend their mains to the neighbouring communities of Portknockie and Findochty; the gas being sent under pressure.

Dundee.—The total income of the gas undertaking for the year was £128,057 1s. 11d., which is £2553 1s. 5d. less than last year—accounted for by the falling off in receipts from the sale of gas. The quantity of gas delivered was 946,326,000 cubic feet; and the amount realized was £89,817 19s. 7d. Coke yielded £19,684; sulphate of ammonia, £11,486; and tar, £6073. The expenditure totalled £97,184 14s. 9d. The cost of the manufacture of gas was £70,503 (coals absorbing £49,413); and the expense of distribution was £15,669. The result of the year's transactions was that a sum of £30,872 was left for disposal. Of this, annuities absorbed £6008; interest, £8351; depreciation on stoves and fires, £3167; sinking fund, £11,749—leaving to be carried to next year's account £2622 14s. 2d. From the statistical tables it is learned that the total quantity of coal used was 81,732 tons, and of gas oil 165,880 gallons. The number of consumers was 48,063—a decrease of 299 compared with last year. Of these, 19,673 use automatic meters. There are on loan 10,077 cookers, 1430 hot-plates, 4236 grillers, and 7752 rings—a total of 23,495. This is an increase for the year of 2426. In addition, there are 6455 gas-heating appliances in use—an increase of 2588. The total debt of the undertaking is £374,611. As to the estimates for the current year, it is calculated that the income will amount to £136,936—an advance of £8879; the revenue from the sale of gas at the former rates being expected to yield £1165 more, the remainder of the increase being made by additional receipts from residual products. Expenditure will be increased by about £12,000 in respect of the coal bill; but by economies in other matters, it is estimated that there will be a balance of £29,778 (which is £1000 less than that of the year just concluded) to meet interest, sinking fund charges, &c. The price of gas is likely to remain unchanged.

Hamilton.—William Stewart, a labourer, was on Wednesday, at Hamilton Sheriff Court, sentenced to forty days' imprisonment for a theft of 25 lbs. of gas-piping. He had five previous convictions.

At the Sheriff Court, Andrew Hamilton, a labourer, was sentenced to three years' detention in the Bostral Institute, Polmont, for having forcibly entered two unoccupied houses in Glasgow Road, Wishaw, and breaking open two automatic gas-meters and taking 5s. from each of them.

Leven.—The Directors of the Leven and Methil Gas Company recommend a dividend of 7½ per cent. and a bonus of 2½ per cent.

Musselburgh.—On Friday, four families at Inveresk Road were found to be suffering from poisoning caused by the inhalation of illuminating gas. The Gas Company officials and workmen have the street up in an endeavour to discover the escape. All victims are recovering.

Thornton.—The gas supply from Kirkcaldy to Thornton was utilized in the village on Thursday night. The Crown Hotel, the first building to be equipped, was brilliantly illuminated.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 1.

Sulphate of Ammonia.

The business of the week has been interfered with by holidays; but the demand for immediate delivery has been well sustained at full prices. The nearest values at the close are £14 15s. per ton f.o.b. Hull, and £14 17s. 6d. to £14 18s. 9d. per ton f.o.b. Liverpool and Leith. A considerable business is reported in the forward position—July-December, 1912, and July, 1912-June, 1913—at £14 10s. per ton f.o.b. Leith; and that is probably the nearest value at the close of the month.

Nitrate of Soda.

This article is quiet on spot Liverpool; but the values remain 11s. per cwt. for 95 per cent., and 11s. 1½d. for refined quality.

LONDON, *June* 3.

Tar Products.

The markets for tar products continue firm. There is a fair demand for pitch, which maintains its price and shows no signs of weakening. The demand for benzols is steady for near delivery; but it is difficult to do business for forward. Solvent naphtha is in good request, and there has been a slight increase in the value. Heavy naphtha is also very firm, and there is a good inquiry for prompt and forward delivery. Creosote maintains its price, and the demand for near delivery is very regular.

The average values during the week were: Tar, 28s. to 32s. *ex* works. Pitch, London, 53s. to 54s. 6d.; east coast, 52s. 6d. to 54s.; west coast, Clyde 53s. to 54s. 6d., Manchester 51s 6d. to 53s. 6d., Liverpool 52s. 6d. to 53s. 6d. Benzol, 90 per cent., naked, London, 11d. to 11½d.; North, 11d.; 50-90 per cent., naked, London, 10d.; North, 9½d. Toluol, naked, London, 10d. to 10½d.; North, 9½d. to 10d. Crude naphtha, in bulk, London, 4⅜d. to 5¼d.; North, 4d. to 4⅜d. Solvent naphtha, naked, London, 1s. 1d. to 1s. 1½d. f.o.b.; North, 11½d. to 1s. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 2⅝d. to 3¼d.; North, salty, 2⅜d. to 2⅝d.; liquid, 2⅝d. to 2¾d. Heavy oils, in bulk, 3¼d. to 3⅜d. Carbolic acid, casks included, 60 per cent., east and west coast, 2s. 4d. to 2s. 5d. Naphthalene, £4 10s. to £10; salts, 45s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

Although the prices have remained about the same during the past week, it has been very difficult to do business at to-day's quotations. For near delivery, the market is certainly quiet; but there is a fair amount of inquiry for forward. Actual Beckton to-day is quoted £14 5s. Outside London makes are £13 17s. 6d. to £14; Hull, £14 16s. 3d.; Liverpool, £14 18s. 9d.; Leith, £15; Middlesbrough, £14 17s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a fuller demand for coal; but the labour stoppages at London have a little interfered with the shipments to that port. In the steam coal trade, best Northumbrians are steady at about 13s. 9d. per ton f.o.b., second-class steams are 11s. to 12s., and steam smalls are firm at 8s. 9d. to 9s. 6d. The production is now normal; and there is a strong demand for some classes of steam coal for export. In the gas coal trade, there has been slight stoppage of deliveries to the Thames; but to the large buyers there has been generally the keeping-up of the contract quantities. Best Durham gas coals are now from 13s. 6d. to 13s. 9d. per ton f.o.b.; second-class kinds are from 11s. 9d. to 12s. 3d.; and "Wear specials" are about 15s. A number of contracts and forward sales of gas coals are reported—for Stockholm at from 17s. 8d. to 18s. 9d. delivered, and at 14s. 6d. f.o.b., according to the class of coal. Some 10,000 tons have been contracted for to Italy at 24s. 9d., delivered at Porto Vecchio; and a similar quantity for early delivery to Savona at 24s. 6d. per ton delivered. There are also contracts in the market for some of the southern gas-works—for Eastbourne and Cowes—and it is evident that higher prices are ruling under such contracts as come forward. Coke is steady. Good gas coke is 15s. per ton at the gas-works, and about 18s. per ton f.o.b.

Scotch Coal Trade.

Prices during the week showed a shrinkage; and the market developed a quiet tone. The export trade is busy; but there is no congestion. On Friday, the prices f.o.b. Glasgow, were: Steam coal, 10s. 3d. to 11s.; splint, 11s. 3d. to 12s.; ell, 10s. 3d. to 10s. 9d.; trebles, 10s. 6d. to 11s.; doubles, 10s. 6d. to 11s.; and singles, 11s. 3d. to 11s. 9d. In Fife and the Lothians, prices have also been cut.

Wells in the City of London.—The Medical Officer of Health for the City of London, in his report for the year 1911, states that in all twelve separate city buildings have been added to the already large number that derive their supply of water from wells. In ten of these new wells were sunk, and in the other two cases existing and disused wells were re-bored to the water-bearing strata, and fitted with modern appliances for pumping.

Lecture on Coal Gas.—In connection with the exhibition of gas appliances recently held at Weston-super-Mare, to which reference was made in the "JOURNAL" last week, Mr. Percy E. Culling, the Secretary of the Weston Gas Company, gave an interesting lecture on "The History, Manufacture, and Uses of Coal Gas." He commenced with a pleasant chat about the pioneers of gas lighting, and then gave his audience some information in regard to the manufacture of gas, and some useful hints as to its utilization. He showed how largely it is now employed for culinary, trade, and motive power purposes, and directed attention to the fact that it is displacing electricity for public lighting. Emphasis was laid on the hygienic value of gas; and the lecturer concluded by giving statistics of the progress of the industry in the twenty years from 1883 to 1903, in which period the capital invested and the number of consumers were more than doubled. The lecture was illustrated by about a hundred lantern views.

Tar Spraying Roads in Lancashire.

The policy of the Lancashire County Council in regard to the tar-spraying of roads as a means of mitigating the dust nuisance is at present being sharply criticized; and in certain interested quarters the suggestion has been put forward that members of the county authority are prejudiced in the matter. This assertion is combated by Mr. J. Campbell, the Secretary to the Lancashire Automobile Club, Blackburn, who says: "For some time we have been in communication with the Lancashire County Council on this subject, and we do not find them at all prejudiced against the treatment of roads with tar. On the contrary, they have just agreed upon an immediate expenditure amounting to several thousands of pounds, not only on tar-spraying, but also on tar macadamizing roads within the county, as they are quite convinced that this is the only effectual method of dealing with the dust nuisance, of which such loud complaints have been made." Unfortunately, certain individuals in the Blackburn rural district area have been working up an agitation against the tar-spraying of roads in the district, on the ground that in some instances these have been rendered unsafe for horses. In order to meet the objection that tar-spraying makes roads slippery and dangerous for horses, the above-named Club have suggested that, where this complaint is put forward by the local authority, the tar-spraying might be confined to a width of about 9 or 12 feet in the middle of the road, so as to leave an untarred space at each side for such horse drivers as prefer it. Mr. Campbell states that "where this is done, and where the tar surface is also sprinkled with small granite chippings, in accordance with the present excellent practice of the expert surveyors of the Lancashire County Council, there would really be a safe foothold for horses all over the road, and in this way the views of all parties could be fairly met."

Public Lighting at Nottingham.—At the meeting of the Nottingham City Council yesterday, the annual report of the Lighting Committee was presented. It contained a reference to the experiments they are conducting with clockwork automatic lighting and extinguishing apparatus, which they say "continues to act very efficiently." It has been applied to 330 lamps. They are also testing apparatus working by pressure. The total number of lamps of all kinds in use on March 31 last was 5289—an increase of 94 in the year.

Proposed New Storage Reservoir for Newport (Mon.).—The Water Committee of the Newport (Mon.) Corporation have had under consideration the advisability of constructing an additional reservoir at Henllys, between Newport and Risca; and they have had a favourable report on the subject from Mr. H. K. Gordon, F.G.S. Two of the reservoirs are already situated in the district; and the present scheme is to construct another, by means of an embankment across the Pantyreos Valley, with a height sufficient to permit a top water-level of 270 feet. The reservoir will have a length of 700 yards, a maximum depth of 55 feet (diminishing to nothing at its north-westerly extremity), an area of 20·2 acres, and a capacity of 200 million gallons.

Bury Corporation Gas Profits.—The annual statement of the Bury Corporation Gas Department shows a net profit of £8733; and the Gas Committee have resolved that, in accordance with statutory obligation, one half of this amount should be applied in relief of rates, and the other half placed to the credit of the gas consumers. It has also been decided that the price of gas for the ensuing year shall be 2s. 3d. per 1000 cubic feet to consumers in Bury, and 3s. to those in the added areas and outside the borough, subject to a discount of 1d. per 1000 cubic feet for prompt payment, and a further reduction of 3d. per 1000 cubic feet from the amount standing to the credit of gas consumers. This means 1s. 11d. net for consumers in the borough, and 2s. 8d. for those outside.

Southampton Water Supply.—At a recent meeting of the Southampton Town Council, the Parliamentary and Water (Joint) Committee reported that they had considered the report of Mr. William Whitaker, F.R.S., and Mr. H. B. Woodward, F.R.S., on the best means of extending the water supply, and recommended the Council to purchase three fields adjacent to the Otterbourne Water-Works; that the Water-Works Engineer (Mr. E. C Rodda) be directed as soon as possible to make a boring, as advised by the experts; and that application be made to the Local Government Board for its approval of the proposed purchase of the fields, and also for their consent to the borrowing of the purchase-money and £2500, the estimated cost of the works for boring. The Mayor (Lieut. H. Bowyer) proposed the adoption of the report, remarking that, after the satisfactory interview the Joint Committee had had with the two experts called in by the Corporation, they were unanimously of opinion that the recommendation was a very satisfactory solution of their difficulty. What the Joint Committee recommended had been previously advised by their former Engineer (Mr. Cecil H. Roberts). The proposition was carried.

Tenby Town Council and the Gas Company.—The relations between the Tenby Town Council and the Gas Company do not seem to be very amicable, judging from what took place at a meeting of Committees of the Council held last Tuesday. A Sub-Committee had been appointed to consider the terms of the lease granted to the Company, and they submitted their report on the matter. Under the terms of the lease, the Company are to produce to the Town Council half yearly, on fourteen days' notice being given, all vouchers as to the cost of coal. They are likewise to furnish an annual statement of accounts, according to the Statute. It is alleged that the former condition has not been complied with, and that the accounts submitted have only been those furnished to the shareholders. The powers of the Council to enforce the proper repair of roads, &c., are clearly defined in the lease; and the Sub-Committee think they should be rigidly enforced. The Council may, at their own expense, renew or provide public lamps and columns and communications to such lamps; and the Sub-Committee consider there is nothing to prevent them purchasing their own lamps and connections in the open market, and, if necessary, doing the work themselves. Mr. E. Allen said he considered that by their failure to send in their annual accounts, according to Statute, the Company had broken the terms of their lease. It was decided that the report should be adopted and acted upon.

Birmingham Water Supply.

The annual report of the Water Committee was adopted at the last meeting of the Birmingham City Council; and, when submitting it, Alderman Beale said the period under review had been abnormal. They had had a summer drought, and some accidents in the winter which very nearly brought them into a tight place. The consumption was largely augmented during the drought, and the income was to some extent increased; but the demands necessitated additional expense, as it was necessary to obtain water by pumping instead of by gravitation. On the whole, however, the revenue account showed great improvement. The report set forth that water-rents had increased by £10,737, or 3·51 per cent. The gross profit was £219,710, against £213,671 a year ago. After meeting all charges, there was a deficiency of £73,098. The contribution received from the borough fund and rate account was £65,000. As regards the coming year, the Committee recommended that provision should also be made for a contribution of this amount from the borough fund.

Bideford Gas Company's Prosperous Year.

In their annual report to the shareholders, the Directors of the Bideford Gas Company congratulated them on the very successful year's business which had been experienced. Notwithstanding the reduction in the price of gas made last year, and the enhanced value of coal through the strike, the balance of profit had been quite satisfactory. Owing to the growth in the business, the office accommodation had become inadequate; and the Directors have purchased property which will be utilized as offices and show-room. They recommended the payment of a dividend of 13½ per cent. on the original shares and 10½ per cent. on the additional shares. Mr. A. G. Duncan, who presided over the meeting, said they were able to sell gas at 2s. 8d. per 1000 cubic feet, or, with the discount, at practically 2s. 6d., which was an exceptionally low price for a company like theirs. The extension of the main into part of the northern area had been satisfactory; and they had 94 new consumers. Mr. R. J. Rew said the Company was paying a higher dividend and supplying cheaper gas than any undertaking of its size in the West of England. The report was adopted, and the dividend recommended declared.

At a conference of the Northern District of the Gas-Workers and General Labourers' Union—in future to be known as the Union of Gas and General Workers—at Sunderland last Tuesday, the question of the amalgamation of Labourers' Unions was discussed, and the conference resolved to instruct the Executive to prepare immediately a scheme and push forward the amalgamation of these unions with all possible speed. The conference also decided to send to the Parliamentary Labour Party a resolution urging them to demand that the Government should find time to deal this session with a Bill to facilitate the amalgamation of various Trade Unions.

Extension of the Bideford Water-Works.

Colonel F. O. Stanfold held an inquiry at Bideford last Wednesday, with reference to the Town Council's application for the sanction of the Local Government Board to a loan of £19,300 for works of water supply. The Town Clerk (Mr. W. B. Seldon) explained that, as long ago as 1866, Mr. Baldwin Latham was consulted by the Corporation, and prepared a scheme for supplying the town with water. This scheme was never carried out in its entirety; and difficulties had arisen from time to time, owing to the shortness of the supply of water. Additional works were constructed in 1870 and in 1891. During the last twenty years, the population had increased by over 1200; and there had been a greater consumption of water. The supply had been insufficient; and in the summer months it had been necessary to cut off the water at night. Mr. Baldwin Latham explained the character of the works which it is proposed to carry out, which include a new reservoir to hold not less than 13,000,000 gallons, and the deepening of the existing upper service reservoir so as to increase its capacity by 5,000,000 gallons. The Borough Surveyor said that it was proposed shortly to scrape the mains, which were now choked considerably in many places.

Lambeth Public Lighting.

The Lighting Committee of the Lambeth Borough Council have reported that in April, 1911, a proposal was made by the South Suburban Gas Company that the 272 street-lamps in the district served by them should be fitted with Sugg's "Windsor" lanterns and inverted burners, at a cost to the Council of about £700; and that, on the completion of the conversion, the charges for the supply of gas and for the lighting and maintenance of the lamps should be reduced by about £24 8s. per annum. It was, however, decided at the time not to take any action in the matter. A letter has now been received from the Company to the effect that practically all the lanterns, which are upwards of forty years old, are worn out, and must be replaced by new lamps; and they contend that the cost of this renewal should be borne by the Council, as the Company's charge for maintenance, while including repairs to existing lanterns, did not provide for replacing those worn out. The Committee, however, pointed out that the Council had always acted upon the assumption that the maintenance charges included the replacement of worn-out lanterns, and that in the remaining large area of the borough served by the Gaslight and Coke Company and the South Metropolitan Gas Company lanterns were renewed by these Companies as part of their maintenance arrangements. The South Suburban Company have now intimated their acceptance of this view, and they are to alter the lanterns accordingly. Having regard to this arrangement, the Committee have agreed that the reduction in the charge for maintenance, &c., offered in April, 1911, on the assumption that the Council would bear the cost of the work of conversion, shall not now be made.

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Omagh Gas Undertaking.

The report of the Auditors (Messrs. Branton) on the working of the gas undertaking of the Omagh Urban District Council for the year ended the 31st of March last shows a gross profit of £1804, against £1605 for the preceding year, or an increase of £199. This result has been brought about to a large extent by a reduction in the unaccounted-for gas, in the cost of purifying, maintenance of the public lamps, &c ; the unaccounted-for gas being 6·03 per cent. of the quantity made, against 11·74 per cent. in the previous year, and 15·8 per cent. for the year 1909-10. The net result was a decreased expenditure of £111 and an increased revenue (principally from slot-meters and fittings) of £87. The unremitting care and attention shown by the Manager (Mr. P. J. O'Callaghan) in the performance of his duties, and the satisfactory results produced, were, in the opinion of the Finance Committee, worthy of some tangible recognition ; and they recommend that he be granted a bonus of £20. Mr. Lynch said the results achieved at the gas-works were a complete justification of the appointment of the present Manager and the acquisition of the undertaking. Mr. M'Loughlin also paid a tribute to the Manager ; remarking that the Council had the benefit of his practical experience. Mr. Hutchinson said he was pleased that there was no objector to the course taken by the Finance Committee. It was not very long ago that Mr. M'Loughlin criticized some of them very severely ; but he now saw the wisdom of the course adopted by them in assisting Mr. O'Callaghan to show so large a profit.

Water-Works for Talkin (Cumberland).—The Brampton Rural District Council have accepted the scheme prepared by Messrs. Taylor and Wallin (Mr. Harry W. Taylor, Assoc.M.Inst.C.E.), of Newcastle-upon-Tyne and Birmingham, for the water supply of the parish of Talkin, in Cumberland. The water will be taken from the main of the Council's scheme, and conveyed through the village to a tank.

Soft Water and Lead Service-Pipes.—During the discussion of a paper on "The Works of the Derwent Valley Water Board," read by Mr. Bernard Everard at a conference of members of the Surveyors' Institution held at Nottingham last Thursday, Mr. W. E. Mills, of Birkenhead, referred to the fact that the Derwent water had only two or three degrees of hardness ; and he wondered whether such soft water would have any injurious effect on the lead service-pipes. He said the Liverpool Corporation had experienced considerable difficulty in this respect with regard to the water-works at Vyrnwy. It was afterwards found that the action had ceased ; and it was generally attributed to a considerable quantity of peaty or other vegetable matter, which, although not visible to the eye, was found in the water during the first period of consumption. As the reservoir filled up after being emptied, the trouble disappeared. He expressed the opinion that, owing to the acquisition of various water-works by corporations, the Government would soon have to step in and take control of the lakes and watersheds in the interests of the smaller communities.

Control of Municipal Expenditure at Manchester.

The scheme drawn up by the Finance Committee of the Manchester City Council to secure continuous supervision and control of the expenditure in the various departments of the Corporation does not, in its main recommendations, affect the trading Committees. In the opinion of the Committee, all new proposals for expenditure or increased expenditure should be brought more prominently before the Council, and estimates of all such proposals presented to the Council by the Committee. At the same time the responsibility for recommending expenditure must rest with the Committees charged with the execution of the Council's various powers and duties. Moreover, as expenditure largely depends upon policy, the Council must be advised on matters of policy by the executive Committees. But the financial bearings of all proposals for expenditure should be examined by the Finance Committee, who should present to the Council a concurrent report upon it when submitting the estimate of the liability proposed to be entered into. In the case of any work or object the expenditure on which may extend over more than one financial year, the Finance Committee say that the estimate should show the total estimated expenditure, the amount proposed to be expended within the period covered by the estimate, and the amount (if any) already expended. This clause does not, however, apply to the revenue accounts of the trading Committees. The annual estimates (except those of the trading Committees) should include provision for expenditure which has been specifically or in principle approved by the Council.

Depreciation of Electric Lighting Plant.—In the course of an inquiry conducted by Mr. T. E. Ekin, M.Inst.C.E., into an application by the York Corporation to borrow £9700 for the purpose of extending the generating plant at the electricity works, the Inspector said the Local Government Board desired him to urge the necessity for the Council to establish a depreciation and renewal fund in order to replace the plant as it became worn out. He had been over the works, and found four very small sets which would not last long. Alderman Meyer (the Chairman of the Electric Lighting Committee) said last year they spent £2196 on renewals, as well as renewing out of current income. Since the undertaking was established, they had received £8000 from the rates, and had paid back £2455. The Inspector : Is there any urgent necessity to place the £2400 to the relief of rates? It will ultimately come back to the ratepayers in just the same way, because if you do not have a reserve fund to meet cases of obsolescence, you will ultimately have to go to the rates. I must urge the necessity of this, and ask you to point out to the Council that, although not quite such a direct relief to the rates, it will be finally to their relief, or the future ratepayers will have to find fresh capital. Alderman Meyer promised to place this view before the Council, adding that he regarded the £8000 received from the rates as a debt owing to the ratepayers, which should be repaid out of the surplus.

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Malta and Mediterranean Gas Company, Limited.—For the year ended March 31, the balance of the general revenue account of this Company was £6652; and the Directors, at the shareholders' meeting on the 11th prox., will recommend the payment of the usual dividends of 4 per cent., free of income-tax—making, with the interim dividend paid last December, 6 per cent. for the year. This will leave a balance of £1750 to be carried forward.

Bridlington Town Council and the Gas-Works.—At the meeting of the Bridlington Town Council last Wednesday, the Finance Committee recommended that the Parliamentary Committee should enter into negotiations for the purchase of the undertaking of the Bridlington Gas Company; but an amendment was carried that "the Parliamentary Committee consider the question of entering into negotiations for the purchase of the Company's undertaking." The Mayor (Mr. L. Mainprize) thought the Parliamentary Committee would drop the matter; and Mr. Martindale considered the proposal had come from a number of "mad hatters," seeing that the Company's £10 shares stood at £34.

Rothwell Gas Undertaking.—The Engineer of the Rothwell Urban District Council (Mr. A. T. Harris) has lately presented his annual report on the working of the gas undertaking. The net receipts in the past financial year were £3617, and the expenditure was £2441; the gross profit being £1176, compared with £1139. Having regard to the reduction made in the price of gas during the year, it was considered a matter of satisfaction for the profits to have been more than maintained, especially as the net average price realized for gas sold to private consumers was upwards of 6d. per 1000 cubic feet less than in the preceding year. The make of gas was 19,183,600 cubic feet—an increase of 2,742,200 cubic feet; the sales through ordinary meters showing an increase of 2,787,700 cubic feet, and through prepayment meters of 504,300 cubic feet—a total of 3,292,000 cubic feet.

Fatality at the Beckton Gas-Works.—On the 21st ult., James Wallace Garrett (22), a carpenter's improver at the Beckton Gas-Works, was fixing a ladder on the jetty when it fell into the river with him, and he was drowned. At the inquest, at which Mr. C. Beasley Robinson (Messrs. Monier-Williams, Robinson, and Milroy) attended on behalf of the Gaslight and Coke Company, it was stated that the ladder was hanging by a ¾-inch rope, the breaking of which caused the accident. The rope was a new one, having been used only once before. It had been tested, and was found to bear 11½ cwt.; whereas the ladder weighed at the outside only 4 cwt. There was a certain amount of vibration from passing trains; and this might, it was thought, have caused the ladder to swing and fray the rope. The medical evidence was to the effect that the case was a typical one of asphyxia from drowning; the deceased having met his death by fright at falling into the water. The Jury returned a verdict of "Accidental death by drowning;" but they suggested that "the ropes should be tested in future before being used." The Coroner (Mr. H. R. Oswald) pointed out that it had been proved that the rope in question stood a strain of 11½ cwt.; and, this being so, testing would not have prevented the accident.

Devonport Water-Works.—The accounts of the Devonport water undertaking for the past year show a gross profit of £14,537. The capital charges amount to £15,348; and a sum of £806 was taken from the reserve fund to make up the loss. Under the Act authorizing the Corporation to acquire the works, it was provided that the payment of sinking fund out of the revenue should not begin for five years from the date of acquisition. This period expired last year. In the meantime, the Water Committee have accumulated out of the profits a reserve fund of £8921, which, after deducting the loss of £806, is now reduced to £8115.

Profit-Sharing in the United States.—It is the intention of Messrs. Henry L. Doherty and Co., of New York, to inaugurate a profit-sharing plan for the benefit of the employees of the various companies they control. Two of them—known as the First Doherty Organization Investing Company and the First Doherty Organization Anticipation Company—have been incorporated under the laws of Maine. The features of the plan were lately announced by Mr. W. J. Barker, the General Superintendent of the Denver Gas and Electric Company. The employees are to be allowed an opportunity of investing their savings in the stock of the two Companies; and the proceeds from the sale of the stock will be placed in high-grade bonds and securities. The Directors will authorize the issue of certificates of indebtedness not to exceed the total paid-up capital and surplus. These certificates will be in denominations of $1, $5, and $10, and they will be payable on or before six months on demand. The rate of interest will be 4 per cent. annually, compounded quarterly. The management of the Companies will be in the hands of eleven Directors, including Mr. Henry L. Doherty and Mr. W. J. Barker.

Gas Supply of Elbeuf.—Reference has already been made in the "JOURNAL" to the disastrous consequences attending the municipal management of the gas supply of Elbeuf, a cloth-manufacturing town on the left bank of the Seine, about 14 miles to the south-west of Rouen. The Mayor, it may be remembered, committed suicide, and the Municipal Council decided to get rid of the gas-works. An agreement was accordingly entered into with the Compagnie Nationale d'Anvers, it was sanctioned by the Prefect, and the Company took possession early this month. The agreement is for a term of forty years. The Company undertake, whatever may be the result of their operations, to pay the Municipality a fixed annual sum of 42,150 frs. for the first nineteen years, and of 21,000 frs. for the rest of the term, together with other sums specified in the agreement. The calorific power of the gas is to be 5000 calories per cubic metre, or about 700 B.Th.U. per cubic foot, with a margin of 10 per cent. The price to be charged is 3s. 5d. per 1000 cubic feet, for the gas used for public lighting and for the municipal and other buildings, 5s. to private consumers for lighting, 4s. 1d. for heating, and 3s. 5d. for engines and industrial operations—the gas used for other than lighting purposes to be supplied through a separate meter. The Company undertake to put in cooking appliances for the working classes free of cost, if requested to do so.

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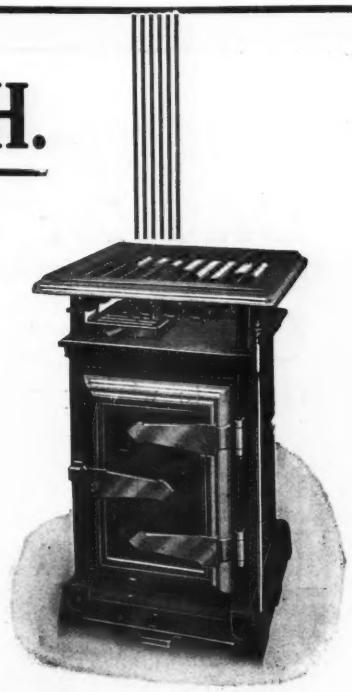

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Successful Divination for Water.—A copious supply of water has just been found on the high ground at Starks Heath Wood, near Rogate (Petersfield), on the property of Mr. A. Richards. An artesian boring was carried out by a water-finding expert and engineer on the conditions of "no water, no pay." The depth of the spring given by the diviner when he visited the site last November was 140 feet; and it has been tapped at 142 feet. The water can be heard running several yards away from the borehole. After twelve hours' test pumping by a large steam-pump, the estimated flow of water is stated to be about 500,000 gallons per day, "the stream of water being about 5 ft. 8 in. thick and 6 feet wide," according to the diviner's statement.

Gas Profits at St. Helens.—From the net profit of £11,503 made last year on the working of the St. Helens Corporation gas undertaking, the Gas Committee have decided to allocate £5000 in relief of rates; being the same amount as was given twelve months ago. The balance will go to the capital redemption fund. As to the reduction in the price of gas by 2d. per 1000 cubic feet, to which reference was made in the "JOURNAL" for the 14th ult., this comes into force as from the 1st of October next, and applies to consumers outside as well as inside the borough. Those using prepayment meters will also get a concession in the way of an extra 3 or 4 cubic feet for 1d.—an arrangement which will mean the changing of the price-fixing mechanism of some 14,000 or 15,000 meters.

Sales of Shares.—The following business in gas shares was recently done by Messrs. Lee and Farr at the Royal Hotel, Slough. Ten original £10 shares in the Slough Gas Company, on which the last dividend was at the rate of 11½ per cent. per annum, were sold for £25 each; and twenty new ordinary £10 shares, ranking for dividend up to £8 1s. per cent. per annum, for £17 each. Six lots of £50 of consolidated stock of the Maidenhead Gas Company, the last dividend on which was at the rate of £5 12s. 6d. per cent. per annum, fetched £56 per lot; while £36 of similar stock was sold for £41 10s. At the County Mart, Shrewsbury, a few days ago, Messrs. Hall, Wateridge, and Owen sold £550 of converted ordinary stock of the Shrewsbury Gas Company in five lots of £100 and one lot of £50. The former averaged £127 each, and the latter fetched £64.

New Filters for Lancaster.—Mr. M. K. North, M.Inst.C.E., held an inquiry on behalf of the Local Government Board, at the Town Hall, Lancaster, last Thursday week, with respect to an application by the Corporation for permission to use for defraying the cost of a filter-house and filtration plant at Scotforth £6078 an unexpended balance of money previously borrowed for the construction of the Blea Tarn reservoir. Mr. A. G. Bradshaw, the Water Engineer, said the house would be of stone, lined with brick, 86 feet long and 30 feet wide. The filters would deal with a maximum flow of 78,000 gallons of water per hour; and the greatest demand was 75,000 gallons. One-third of the supply was from the old service reservoir, and was not going through Blea Tarn pipes. The type of filtration plant proposed to be erected was working satisfactorily in other towns. The tender for it was £4550; for the building, £1023; for land, £175; and for other work, £350.

Salford's Claim against Manchester for Water Overcharge.—Under the award of Mr. James Diggle, Assoc.M.Inst.C.E., of Heywood, and Mr. Joseph Haynes, of Manchester, the Arbitrators appointed to deal with the claim which the Salford Corporation made last year against the Manchester Corporation in respect of an alleged overcharge for water supplied, the last-named authority will refund to the former a sum of £810 13s. Salford obtains its water supply from Manchester; and the claim arose through the suggested faulty registration of one of the meters at the boundary of the borough in favour of the Manchester Water Department. After having expert advice, the Salford Water Committee made a claim for £1500 to cover the overcharge. The Manchester Water Department did not dispute that the meter in question, which was fixed in 1906, occasionally registered inaccurately, but the amount they made out to be due to Salford in consequence differed greatly from the latter's claim. In the end the matter went to arbitration.

Portsmouth Water Company.—The half-yearly general meeting of this Company was held on the 23rd ult.—Colonel C. Lanyon Owen, J.P., in the chair. In moving the adoption of the report, which was noticed in the "JOURNAL" for the 21st ult. (p. 532), the Chairman referred to the death of his predecessor, the late Mr. William Grant, who, he said, was a man of the highest rectitude of character, and a first-rate business man. Whatever he undertook he did with great ability; and his death was a serious loss to the Company. After reviewing the report, the Chairman said there was an improvement of £927 on the half-year's working, and of £3000 on the year. He alluded in terms of high appreciation to the work of the Secretary (Mr. J. L Wilkinson) and the Engineer (Mr. Herbert Ashley, M.Inst. C.E.), who, he said, were officials of great ability, who did their utmost for the Company; and they had an excellent staff under them. The report was adopted. A vote of condolence with the relatives of the late Mr. Grant was passed.

Newbury Gas-Works Results.—The report submitted by the Gas Committee at the last monthly meeting of the Newbury Town Council stated that the gross profit for the year to March 31 amounted to £4073, and was the largest on record. The Committee recommended that £400 be contributed to the district fund, and a further £300 placed to the credit of the renewal fund account. The revenue account showed receipts amounting to £14,631; while the cost of manufacture, distribution, public lamps, management, bad debts, and discounts totalled £10,557. There had to be deducted £2485 for sinking fund instalments, interest on mortgages, and other fixed charges; leaving a surplus for disposal of £1587. Alderman Smith proposed the adoption of the report, and compared the figures with those of last year. He pointed out that the whole cost of the old works had been written off out of profits, and that during the last ten years the undertaking had furnished £2640 for the relief of the rates, while gas at 2s. 10d. per 1000 cubic feet was very reasonable. The Committee regarded the Gas Department as a credit to the Manager (Mr. W. R. Davey), and also to the Council. The report was adopted.

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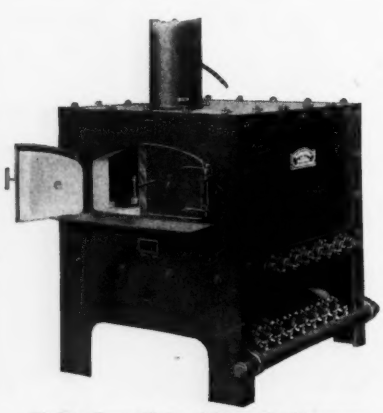

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The tender of Messrs. Porter and Co., of Lincoln, for repairing the holder at the gas-works of the Horncastle Urban District Council, has been accepted. There were seven tenders, and that of Messrs. Porter was the lowest but one.

The *agenda* for to-morrow's meeting of the Manchester City Council contains the following resolution in the name of Mr. Hayne, one of the Labour members: "That the Gas Committee be instructed to consider and report as to the advisability of arrangements being made for the supply of coke in small quantities from local yards in the various wards of the city."

A verdict of "Accidental death from suffocation by gas" was returned on Monday last week at an inquest held on an unknown man who was found dead in bed at a café in Carlisle; the room being full of gas and the tap turned on. It was stated that the man went to bed on the previous Friday evening, and left instructions that he was not to be called early the following morning. As it was hiring-time, the management of the café were very busy next day, and the visitor was forgotten until Saturday evening, when he was found suffocated. The Deputy-Coroner (Mr. T. S. Strong) said the man seemed to be a countryman; and as these people were not accustomed to gas, it was possible he might have blown out the light. The Jury recommended that the place should be properly ventilated.

The City of Birmingham Gas Department Foremen's Social Association held their first annual dinner at the White Horse Restaurant in Congreve Street last Wednesday evening, and so successful in every way was it, that one can safely assume there will be a second and subsequent annual functions of a similar character, The chair was taken by Mr. R. S. Hilton (the Secretary and General Manager of the Department); and among those present were Alderman J. H. Lloyd, J.P. (the Chairman of the Works Sub-Committee of the Gas Committee), Mr. Walter Chaney (Engineer of the Saltley works), Mr. John Foster (Engineer at Windsor Street), Dr. W. B. Davidson (Engineer at Nechells), Mr. T. H. Hack (Engineer at Swan Village), and Mr. James Hewett (the Distributing Engineer). A party of between seventy and eighty sat down to dinner; and a first-class musical programme was interspersed with some appropriate speech-making. The Chairman having proposed "The King," Alderman Lloyd submitted "Our Guests." This was responded to by Mr. Hilton, who, in the course of his remarks, pointed out the great field that yet remains open to the gas industry in Birmingham—particularly in connection with the melting of brass. As some indication of the nature of the possibilities in this respect, he stated that negotiations had nearly been completed for a supply of gas to the furnaces of one firm, the estimated annual consumption for which would be upwards of 150 million cubic feet. The toast of "The Engineers and Assistants" was in the hands of Mr. S. Davis, and was replied to by Mr. Foster. "The Foremen" was proposed by Mr. Chaney. Mr. Floyd, of Adderley Street, responded with an excellent speech, in which he emphasized the advantages of the good relations which exist between those engaged on the various gas-works and the administrative branches of the Department.

Those of our readers who require information in regard to Mond gas and the apparatus employed in its production may be referred to a new and enlarged edition of the catalogue just issued by the Power-Gas Corporation, Limited, of Stockton-on-Tees, of producer plants on the system named, both with and without ammonia recovery. In addition to some effective illustrations of the plant, the catalogue contains general information and useful data, together with a list of installations which have been carried out by the Company.

In the course of a Local Government Board inquiry held at Keighley last Wednesday, respecting an application by the Corporation for authority to borrow sums of £6576 and £1660 to cover the cost of certain extensions of the electric lighting plant, a member of the Electricity Committee (Mr. W. Coleman) opposed the application. His first reason was that the Committee were selling current at ⅜d. per unit, and were paying in sinking fund alone ½d. per unit. Next he submitted that it was not necessary to erect a water-tower, as had been suggested. The boilers already installed were, in his opinion, quite capable of doing the work required without the erection of another boiler, as had been proposed. The inquiry was adjourned *sine die*, in order that the Electrical Engineer (Mr. A. Webber) might have an opportunity of furnishing further particulars regarding the excess of expenditure.

APPLICATIONS FOR LETTERS PATENT.

11,885.—Windsor, F. J., "Pinless gas-cock." May 20.
11,913.—Summers, H. H., "Acetylene generators." May 20.
11,935.—Horton, W. T., "Production of gas." May 20.
12,007.—Chandler, S., and Waller, B. B., "Treating gas either in a heated or cooled state for purification." May 21.
12,032.—Denby, W., "Gas-ranges." May 21.
12,109.—Helps, G., "Incandescent lamps and burners." May 22.
12,192.—Edwards, H. D., and Balfour, I. H., "Gas-compressors." May 23.
12,196—Keith, J. & G., "Gas-lamps." May 23.
12,257.—Sykes, F., "Retorts." May 23.
12,336.—Trebert, H. L. F., "Gas-engines." May 24.
12,369.—Meyer, M., and Holwech, W., "Producing air gas." May 24.
12,402.—Fletcher, Russell, and Co., Ltd., and Fletcher, T. W., "Gas-furnace for heating metals." May 25.
12,413.—Firth Blakeley, Sons, and Co., Ltd., and Lowe, J., "Generation of water gas." May 25.
12,453.—Coleman, E. W., "Gas-stoves." May 25.
12,479.—Societe des Gazogenes Marconnet, "Gas-generators." May 25.
12,483.—Walker, E. R., "Scraping water-mains." May 25.
12,500.—Marsh, R. G., "Self-correcting high-pressure gas-meter." May 25.

THESE ATTRACTIVE BOOKLETS

Give full Particulars of the most modern and practical gas appliances for all requirements.

May we send you a supply for distribution?

THE PARKINSON STOVE CO., LTD.,
BIRMINGHAM and LONDON.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

MANAGER, TAR-WORKS. No. 5586.
TRAVELLER. No. 5583.
REPRESENTATIVE. No. 5581.
GENERAL FOREMAN. No. 5575.
STILLMAN. No. 5587.
JUNIOR CLERK. No. 5588.

Appointments, &c., Wanted.

ENGINEER, MANAGER, AND SECRETARY. F. Smallbone, Woodford Green.
SULPHATE PLANT MAKER AND REPAIRER. Leadburner. 15, Martin Street, Stratford.
FITTER, SLOT METER COLLECTOR, &c. No. 5584.
CHIEF-ASSISTANT. No. 5585.

Representation (Central Europe) Wanted.

SEWAGE CLARIFICATION. M.K. 5615, bef. Rudolf Mosse, Munich.

Plant, &c. (Second-Hand), for Sale.

LAMP COLUMNS AND LANTERNS. Barnsley Gas Company.
PURIFIERS, &c. Cannock, &c., Gas Company.
STATION METER, &c. Llynvi Valley Gas Company.

Plant, &c. (Second-Hand), Wanted.

GASHOLDER, &c. No. 5582.

Meeting.

INSTITUTION OF GAS ENGINEERS. Royal United Service Institution, June 11, 12, and 13. 10.30 o'clock.

Stocks and Shares for Sale.

BRISTOL WATER COMPANY. Bank Auction Mart, Bristol. June 6.
CHRISTCHURCH GAS COMPANY. London Mart. June 18.
GRAYS AND TILBURY GAS COMPANY. June 18.
HODDESDON GAS AND COKE COMPANY. Bell Hotel, Hoddesdon. June 12.
NEWPORT (MON.) GAS COMPANY. By Tender. June 14.
SOUTHEND WATER COMPANY. London Mart. June 25.
SOUTHGATE AND DISTRICT GAS COMPANY. London Mart. June 18.
SOUTH-WEST SUBURBAN WATER COMPANY. London Mart. June 18.
YARMOUTH WATER COMPANY. London Mart. June 18.

TENDERS FOR

Coal and Cannel.

ASHBOURNE GAS COMPANY. Tenders by June 10.
ASHFORD URBAN DISTRICT COUNCIL. Tenders by June 14.
ATHERTON URBAN DISTRICT COUNCIL. Tenders by June 12.
BARROW-IN-FURNESS CORPORATION. Tenders by June 6.
CHORLEY GAS DEPARTMENT. Tenders by June 18.
DUDLEY GASLIGHT COMPANY. Tenders by June 17.
EAST DEREHAM URBAN DISTRICT COUNCIL. Tenders by June 19.
EASTBOURNE GAS COMPANY. Tenders by June 6.
ELSECAR, WENTWORTH, AND HOYLAND GAS COMPANY. Tenders by June 12.
FORFAR GAS CORPORATION. Tenders by June 12.
GLASGOW GAS DEPARTMENT. Tenders by June 11.
LEIGH (LANCS.) GAS AND WATER DEPARTMENT. Tenders by June 18.
PETERBOROUGH GAS COMPANY. Tenders by June 10.
RHYL URBAN DISTRICT COUNCIL. Tenders by June 16.
SAFFRON WALDEN GAS AND WATER DEPARTMENT. Tenders by June 22.
SHREWSBURY GAS COMPANY. Tenders by June 22.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 4.

Coke.

SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 4.

General Stores (Sulphuric Acid, Lime, &c.).

FORFAR GAS CORPORATION. Tenders by June 12.

Meters.

FORFAR GAS CORPORATION. Tenders by June 12.

Pipes, Fittings, &c.

ASHFORD GAS DEPARTMENT. Tenders by June 14.
FORFAR GAS CORPORATION. Tenders by June 12.

Residual Products.

FORFAR CORPORATION. Tenders by June 12.

Roof, &c.

COVENTRY GAS DEPARTMENT. Tenders by June 17.

Tar and Liquor (*see also* Residual Products).

ACCRINGTON GAS AND WATER BOARD. Tenders by June 12.
ATHERTON URBAN DISTRICT GAS DEPARTMENT. Tenders by June 12.
CONGLETON GAS DEPARTMENT. Tenders by June 8.
EASTBOURNE GAS COMPANY. Tenders by June 8.
HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY. Tenders by June 13.
READING GAS COMPANY. Tenders by June 17.
STOKE-ON-TRENT GAS DEPARTMENT. Tenders by June 13.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 4.
TAUNTON GASLIGHT AND COKE COMPANY. Tenders by June 15.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by June 17.

GAS COMPANIES' STOCK AND SHARE LIST.

The Stock Exchange was rather slow at getting into fair swing again after the holidays, for many members were still away on Tuesday morning. But the pace began to mend, though at no time was business really brisk. The general tendency, however, steadily improved. The tension which had been produced by the speculative position was relieved; and the settlement of this week was looked forward to without anxiety. The plain evidence, too, that the ill-judged strike was doomed to failure, if the authorities would but continue calmly to protect willing workers and not be gammoned into making bargains with agitators, had a very beneficial effect. The chief market to gain was Rails; Government issues continuing rather feeble. The opening day was quiet, and the tendency was not cheerful. Gilt-edged things were uneven; but Consols did not move. Railways were anxious, and were lower all round. A pleasant change was apparent on Wednesday; the tone being bright and cheerful. Consols rose ⅛ for money and account, Rails had a smart rise throughout the list, and Americans looked up at first, though they looked down afterwards at the Presidential election conjuring tricks. Thursday was fairly good in some markets. Consols were steady, and Foreign calm and fair; but Rails were a bit uneven at the close. Friday was cheerful, though business was not very active. Government issues were inclined to shake; but Rails were quite strong at the sick aspect of the strike. Saturday ended the week with quite a bright tone—pleased that the settlement had gone through so well, and that the defeat of the factors of industrial strife was at hand. Consols closed at 77½ to 77¾—a rise of ⅛ in the week—and Rails were still on the up-line. In the Money Market, there was a good demand, and rates hardened in the first half of the week; but from that point they eased away. Business in the Gas Market was no better than moderate, and prices on the whole were rather easier than the week before. In Gaslight and Coke issues, the ordinary was not quite so firm, transactions showing a range of from 104⅛ to 105—a fall of ⅛. In the secured issues, the maximum was done at 85½, the preference at from 102½ to 103½, and the debenture at 79 and 79½. South Metropolitan also was making no advance; the limits of prices marked being from 119¼ to 121. The debenture made from 79 to 79⅜. In Commercials, the 4 per cent. changed hands at 109 and 110, the 3½ per cent. at 104, and the debenture at 76½ and 75⅜. Among the Suburban and Provincial group is a puzzle to which we have before now adverted, and to which a dissatisfied shareholder addressed a letter last week—*i.e.*, the vagaries of Alliance and Dublin. Last week it was put down 4 points to a 6½ per cent. price. Transactions in Brentford old marked 260, ditto new 197½, Bromley "A" 120, and Wandsworth 141. In the Continental companies, Imperial realized from 186 to 187, ditto debenture 89, and European 19⅛ and 19¾. Among the undertakings of the remoter world, Bombay made 6 and 6⅛, Monte Video 12 and 12¼, Primitiva from 7 1/16 to 7⅛, and ditto preference from 5 5/32 to 5⅜.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	72—77	−¼	6 9 10
374,000	Stk.	Jan. 12	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
250,000	5	Apl. 12	7½	Bombay, Ltd.	6—6⅛	..	5 15 5
50,000	10	Feb. 29	15	Bourne- mouth Gas and Water } 10 p.c.	28¼—29½	..	5 1 8
332,000	10	,,	7	} B 7 p.c.	16—16⅛	..	4 4 10
75,000	10	,,	6	} Pref. 6 p.c.	14½—14⅝	..	4 1 4
380,000	Stk.	,,	13	Brentford Consolidated	258—263	..	4 18 10
330,000	,,	,,	10	Do. New	196—201	..	4 19 6
50,300	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
219,055	Stk.	Feb. 29	11	Brighton & Hove Orig.	215—220	..	5 0 0
244,200	,,	,,	8	Do. A Ord. Stk.	156—159	..	5 0 8
490,000	20	Mar. 28	12½	British	44½—45½	..	5 9 11
120,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. Stk.	93—95	..	4 4 3
109,000	,,	Feb. 15	6	Bromley, A 5 p.c.	128—133	..	4 10 3
165,700	,,	,,	4½	Do. B 3½ p.c.	98—101	..	4 9 1
82,278	,,	,,	5½	Do. C 5 p.c.	117—120	..	4 11 8
55,000	,,	Dec. 29	3½	Do. 3½ p.c. Deb.	80—82	..	4 5 4
350,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	95—97	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	76—80	..	5 12 6
157,150	Stk.	Feb. 15	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,513,280	Stk.	Feb. 29	5/9/4	Commercial 4 p.c. Stk.	108—110	..	4 19 4
560,000	,,	,,	5½	Do. 3½ p.c. do.	103—105	..	5 1 6
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	75—77	..	3 17 11
800,000	Stk.	May 31	4	Continental Union, Ltd.	81—84*	..	4 15 3
200,000	,,	,,	7	Do. 7 p.c. Pref.	133—135*	+½	5 3 8
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
840,150	10	Jan. 31	10	European, Ltd.	19½—20½	..	4 17 7
16,160,600	Stk.	Feb. 15	4/14/8	Gas- } 4 p.c. Ord.	104—105	−½	4 10 2
2,600,000	,,	,,	3½	light } 3½ p.c. max.	84½—86½	..	4 0 11
4,062,235	,,	,,	4	and } 4 p.c. Con. Pref.	102—104	..	3 16 11
4,631,705	,,	Dec. 14	3	Coke } 3 p.c. Con. Deb.	78—80	..	3 15 0
258,740	Stk.	Mar. 14	5	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	16½—17	..	6 9 5
131,000	Stk.	Mar. 14	7½	Ilford A and C	155—158	+3½	4 14 11
65,780	,,	,,	6	Do. B	123—125	..	4 16 0
65,500	,,	Dec. 29	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
4,940,050	Stk.	May 15	9	Imperial Continental	185—188	−1	4 15 9
1,235,000	Stk.	Feb. 15	3½	Do. 3½ p.c. Deb. Red.	88—90	..	3 17 9

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
200,242	Stk.	Mar. 14	6	Lea Bridge Ord. 5 p.c.	125—129	..	4 13 0
561,000	Stk.	Feb. 29	10	Liverpool United A.	219½—221½	..	4 10 3
718,100	,,	,,	7	Do. B.	158—160	..	4 7 6
306,083	,,	Dec. 29	4	Do. Deb. Stk.	100—102	..	3 18 5
75,000	5	Dec. 14	6	Malta & Mediterranean	4⅜—5	..	6 0 0
560,000	100	Apl. 1	5	Met. of } 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 31	3½	Monte Video, Ltd.	11½—12*	..	5 16 8
1,775,892	Stk.	Feb. 15	4½	Newc'tle&G'tesh'd Con.	99—101	..	4 6 8
529,705	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	86—88	..	3 19 7
55,940	10	Feb. 29	7/7/0	North Middlesex 7 p.c.	14—15	..	4 18 0
300,000	Stk.	May 15	8	Oriental, Ltd.	134—136	..	5 17 8
60,000	5	Mar. 14	8	Ottoman, Ltd.	7—7⅛	..	5 6 8
31,800	53	Feb. 29	13	Portsea Island A	137—140	..	4 18 4
60,000	50	,,	13	Do. B	130—133	..	4 17 9
100,000	50	,,	12	Do. C	127—130	..	4 12 4
398,490	5	May 15	8	Primitiva Ord.	7—7⅛	+1/16	5 10 4
796,980	5	Dec. 29	5	Do. 5 p.c. Pref.	5⅛—5⅝	−⅛	4 13 0
488,900	100	June 1	4	Do. 4 p.c. Deb.	95—97*	..	4 2 6
312,650	Stk.	Dec. 29	4	River Plate 4 p.c. Deb.	95—97	..	4 2 6
250,000	5	Apl. 12	12	San Paulo, Ltd.	11¼—11⅜	..	5 2 2
115,000	10	,,	6	Do. 6 p.c. Pref.	11⅜—12¼	..	4 18 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Mar. 14	10	Sheffield A	235—237	..	4 4 5
209,984	,,	,,	10	Do. B	234—236	..	4 4 9
593,500	,,	,,	10	Do. C	234—236	..	4 4 9
90,000	10	May 31	7½	South African	7½—8½*	..	8 16 6
6,429,895	Stk.	Feb. 15	5/9/4	South Met., 4 p.c. Ord.	119—121	..	4 10 6
1,895,445	,,	Jan. 12	3	Do. 3 p.c. Deb.	78—80	..	3 15 0
209,820	Stk.	Feb. 29	8½	South Shields Con. Stk.	156—158	..	5 7 7
605,000	Stk.	Feb. 15	5/16/8	S'th Suburb'n Ord. 5 p.c.	122—124	..	4 14 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	,,	Jan. 12	5	Do. 5 p.c. Deb. Stk.	119—121	..	4 2 8
502,310	Stk.	May 15	5	Southampton Ord.	105—107	..	4 13 6
120,000	Stk.	Feb. 15	7½	Tottenham } A 5 p.c.	144—147	..	4 17 0
483,940	,,	,,	6⅔	and } B 3½ p.c.	114—116	..	4 17 0
149,470	,,	Dec. 29	4	Edmonton } 4 p.c. Deb.	96—98	..	4 1 8
182,380	10	,,	5	Tuscan, Ltd.	8⅜—8⅞	..	5 12 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 29	5	Tynemouth, 5 p.c. max.	112—114	..	4 7 9
255,636	Stk.	,,	6⅔	Wands- } B 3½ p.c.	141—144	..	4 15 6
85,766	,,	Dec. 29	3	worth } 3 p.c. Deb. Stk.	71½—73½	..	4 1 8

Prices Marked * are "Ex Div."